The American Journal of Surgery

NEW SERIES, VOL. V NOVEMBER, 1928 No. 5

SINGLE TRAUMA, CARCINOMA & WORKMEN'S COMPENSATION*

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THE possibility of a single trauma causing carcinoma is very much doubted and is even considered impossible by many careful observers. It seems best, therefore, to present as the "text of this discourse" 3 cases which would seem to the average judicial layman to prove definitely that a causal relationship may exist. If we will admit that the relationship has been a true one, even in 1 case, we must consequently admit that it may likewise be a possibility in any other case in which this relationship comes up for serious consideration.

CASE REPORT

CASE 1 (Fig. 1). H. W., aged forty-two, automobile mechanic. Eight weeks before observation he struck himself a severe blow with a wrench at the exact point of the tumor shown in the photograph. The external surface of the cheek was not broken but the mucous membrane on the inner side was broken and bled. This wound in the mouth healed after about two weeks. At about this time a "pimple" formed on the skin surface. This broke open, began to bleed, and grew rapidly so that the condition shown in the photograph was produced about eight weeks from the original injury. A biopsy at this time showed squamous epithelioma.

Summary. A young man, no previous trouble, a blow sufficient to break the mucous membrane in the mouth, skin carcinoma appearing in two weeks, reaching the condition shown in eight weeks. Microscopical confirmation.

It is hard to believe this was a coincidence or that the blow "called attention to the trouble." The writer advised the insurance company that this blow caused the cancer and this opinion was accepted.

FIG. 1. Case 1. H. W. Aged forty-two. Struck face at exact point of tumor with wrench eight weeks before observation. A "pimple" appeared two weeks later and continued to grow to present size. Microscope showed squamous epithelioma.

* Read before the International Association of Industrial Accident Boards and Commissions, Sept. 12, 1928.

Case II (Fig. 2). D. P., aged sixty-two, motor truck driver. Two years before while driving his truck his right ear was frostbitten; the skin at the top of the pinna remained rough, thick and tender; gradually this thickening became more prominent at the point shown in the photograph. This prominent point has remained and has very slowly increased in size. Examination June 26, 1928 showed, at the point indicated, a hard nodule about 1/8 in. in diameter, not ulcerated, movable on cartilage. It was excised. Microscope showed basal-celled epithelioma.

Fig. 2. Case II. D. P. Aged sixty-two. Two years ago top of ear was frostbitten. Skin always remained rough and a nodule developed at arrow. Microscope showed basal-celled epithelioma.

Summary. This man had no thought of compensation and, beyond the human tendency to attribute all our ills to some external factor, had no reason to attribute his skin carcinoma to the frostbite. Abnormal skin was noted from the time of the frostbite until the excision of the cancer two years later. Frostbite, pathologically speaking, may have a different mode of action from a blow but it damages tissue, leaves some "scar" tissue, and from a legal point of view the two should be considered identical.

Case III[1] (Fig. 3). B. T., aged fifteen. Seven months before observation patient went into a burning building; his foot went through a burned board causing an abrasion about the middle of the shin; the wound never healed. Seven months after the injury the ulcerated area was grafted, result, a complete failure. Wassermann was negative. The ulcerated area continued to spread and at the end of one year it was 3 in. in diameter. Biopsy was done at this time. Willis Waite, pathologist to Hotel Dieu, El Paso, Texas, reported squamous epithelioma. Dr. Waite kindly gave a slide to the writer's laboratory where this diagnosis was confirmed.

Fig. 3. Case III (Dr. Brown). B. T. Aged fifteen. Seven months before observation scratched shin on a hot board. Wound never healed. Microscope showed squamous-celled epithelioma.

Summary. A boy aged fifteen, skin carcinoma in a very unusual place. Certainly no cancer was present before and became aggravated. Wound never healed after injury. One year later, microscopical proof of squamous epithelioma.

It would seem that these 3 cases should convince anyone that carcinoma can be

[1] Brown, L. L. & Brown, C. P. Case of epithelioma in boy fifteen years. *Southwestern Medicine*, 12: 69, 1928.

caused by a single trauma. The sequence is rare. If we assess the real cases, against the thousands of traumas occurring every day, it is enormously rare. Furthermore in the malignant conditions, either carcinoma or sarcoma, as they are met with clinically—the cases presented under such circumstances that an antecedent trauma should be accepted as a cause—are again very rare. Coley[1] in an elaborate presentation of this subject reports 970 personal cases of sarcoma with a history of trauma in 23 per cent and 250 cases of carcinoma with a history of trauma in 32 per cent. Of these 120 were breast carcinoma with a history of trauma in 43.3 per cent. McWilliams reported 44.6 per cent for breast carcinoma. In many of these cases the data is not convincing and while these figures fairly accurately represent alleged trauma, neither Coley nor anyone else believes that the percentage of cases which should be accepted as definite from a legal point of view is nearly as large as these figures.

WAR INJURIES AND CARCINOMA

It was thought that the enormous number of injuries in the Great War would offer valuable information on the relation between trauma and both carcinoma and sarcoma, but inquiries have been singularly sterile. Regaud, after an enormous experience in Paris, kindly stated to the writer under date of February 27, 1928, that he has not observed cancer after a war wound. The French Minister of War also very courteously wrote on June 6, 1928, that the Ministry also had no record of such cases. Apparently only 1 case, and that a sarcoma of the maxilla after a gunshot wound, has been recorded by the British.[2]

The United States Veterans' Bureau has apparently no cases of carcinoma after injury. The Bureau has records of 56 cases of sarcoma. The abstracts of these cases have been furnished through the kindness of E. O. Crisman, Medical Director. The connection is reasonably definite in only a few of these cases, and as they are all sarcomas, in which class the facts are fairly well established, they do not come within the present inquiry.

Dr. W. S. Bainbridge from his place on the International Congress of Military Medicine has had an unusual opportunity to study the results of war wounds and has done so. His results have been equally barren.

IN DEFENSE OF TWO PROPOSITIONS

There are two propositions to be defended:

1. That carcinoma (and sarcoma, too) may arise from a single trauma.
2. That such cases are extremely rare.

It remains for us to try to evaluate these two postulates in such a way that justice is done both to the employer and the employe. And we should consider how, as commissioners, referees and medical advisers, we can help an employe with cancer, truly due to trauma, to receive the compensation to which he is entitled by law even if he does have an extremely rare condition. On the other hand, as a writer has said in another connection, we should prevent an employee, however sincerely he may believe his own story, from selling his old cancer to his employer.

Segond, who has tried to put this subject on a working basis in France, has postulated five so-called guarantees as follows:

1. The authenticity of the trauma.
2. Sufficient importance or severity of the trauma.
3. Integrity of the part prior to the injury.
4. Correspondence of the tumor to the exact site of the injury.
5. A date of appearance of the tumor not too remote from the time of the accident to be reasonably associated with it.

Two others have been suggested:

1. Continuous pathological manifestations, pain, swelling, hematoma, etc., at the site of the injury up to the time of appearance of the tumor.

[1] Coley, W. B. Injury as a causative factor in cancer. *Ann. Surg.*, 53: 449, 1911.

[2] Pickwell, *Brit. Med. J.* (Dec. 17) 1927.

2. Microscopical proof of cancer.

These guarantees need discussion.

The importance of the authenticity of the trauma is obvious. The severity of the trauma is of great importance. It should be demanded as an essential that there was something more than a "bump" which is vaguely remembered and to which little or no attention was paid. The injury must be of sufficient severity to devitalize or at least considerably alter normal tissues. It must be sufficient to cause definite pain, swelling, ecchymosis, more or less impairment of function, etc. that is, conditions which should leave some real scar tissue.

The integrity of the part prior to injury is of course important, but it is a point on which there will rarely be any information except the statement of the somewhat biased claimant. The correspondence of the tumor to the exact site of injury is a sine qua non.

The question of the time elapsing between the injury and the tumor symptoms is extremely difficult to adjudicate. One writer feels that a sarcoma should appear within three weeks to a year, carcinoma six weeks to a year. Most writers have considered that the distal limit should be from two to three years. Definite cases, however, are recorded in which carcinoma has developed in well-marked scar tissues or sarcoma in fracture unions after many more years. A time limit, therefore, can hardly be set and this factor must be weighed with other factors in each individual case.

It does not seem proper to demand *continuous pathological manifestations* (*cf.* 6) as well established cases have shown the first tumor evidences even years after the immediate trauma symptoms have subsided.

Microscopical proof (*cf.* 7) is of academic interest but not of much medico-legal importance. All that a referee needs to know is that the claimant has a lump which disables him or may have killed him. Its microscopical structure is immaterial.

PARTS OF BODY INVOLVED

Cases raising the question of single trauma and carcinoma will involve most frequently the skin, second, the breast, and third the abdominal or thoracic viscera. It will be best to consider those three sites a little in detail.

1. *The Skin.* The 3 cases cited are typical of those that will arise. Fortunately in this country we have little or no cancer classifiable as an occupational disease. In England, chimney-sweep's cancer is still a factor and mule-spinner's cancer in certain textile workers is causing the authorities considerable anxiety. This is caused by constant irritation of the scrotum by oil used in the machinery. Dr. Kennaway of the London Cancer Hospital has kindly furnished me with clinical notes and slides of a carcinoma of the right first finger of a man who for a long time was engaged in oil spraying in mosquito work. He habitually kept his first finger on the nozzle of the spraying apparatus to guide it and the constant irritation of this finger by the oil evidently produced the carcinoma. The theory is that the greater portion of oil used in England, which comes from Roumania, contains some specially irritating chemical substance. The Surgeon General informs me that no such case was reported in our canal work. If, as seems to be the tendency, occupational diseases are later to be made compensable the connection between carcinoma and chronic irritation must be further studied.

In considering the skin the very definite connection between single trauma and melanocarcinomas must be remembered. Many unquestionable cases have been recorded in which a blow or, more important still, a stab wound or a cut of a pigmented wart or mole has been immediately followed by a rapidly spreading and very fatal form of cancer (melanocarcinoma or melanoma). No one who has studied these conditions questions this fact and when a definite trauma is proved before such an occurrence there is little room for argu-

ment. One of the most interesting cases of this kind came under my observation.

Mrs. S., aged fifty-five. She had a congenital brown mole over one shoulder blade. She had ridden in motors a great deal for many years with no difficulty. One day she purchased a new car and immediately left her home in Northeastern Pennsylvania for a tour in New England. Some point on the back of the seat of the new car rubbed on this mole and when she reached Boston at the end of the second day the mole was bleeding and felt sore and irritated. When she arrived home at the end of two weeks, the mole, which was about 1 in. in diameter, presented over its whole surface an angry bleeding fungating mass elevated about ¾ in. A wide excision was at once made. Microscopical examination showed melanocarcinoma. Death occurred five years later from a growth in the stomach. It was never proven whether this growth was recurrence or an independent stomach carcinoma.

Another phase of skin cancer is concerned with those that develop in scars without any additional trauma. The occasional occurrence of such cases is unquestionable. They occur most frequently in scars of burns but they may occur in any scar. They may occur many years after the burn has healed. The writer has a patient who had a burn on the thigh when eight years old. A carcinoma developed in this scar at the age of forty-three. Biegel (quoted in Coley's article from which much in this paper has been extracted) reports a man who at the age of seventy-four developed a "cancer" in the scar of a foot amputation done in childhood.

From this it will be seen that any scar may, though rarely, develop carcinoma many years after the injury. If the original injury was chargeable to an industry it would seem that such an end-result, even if it is fatal, should in justice be charged again to the industrial injury. Unless there are special time limitations in State laws, the writer can hardly see how such a claim can be opposed, if the facts are clearly determined.

2. *Carcinoma of the Breast.* Of the male breast J. B. Murphy has said, "Carcinoma is very frequently the sequence of a mild trauma of single occurrence. It is the only place in the body where this is so." Two years ago the writer made an analysis of records of 418 male breast carcinomas and was much impressed by the frequency with which trauma was alleged as a cause. Some cases are reported of carpenters, shoemakers, and the like where constant pressure of tools has been considered the cause and these cases must be considered if repeated injury attains the same status in compensation laws as single injury. Further cases have been reported in men in which breast carcinoma has followed blows by base balls, gunshot wounds of the nipple, laceration of the nipple and sword thrust, so closely that acknowledgment of the trauma as a cause seems necessary.

The relation of trauma and breast carcinoma in women is more obscure but with the ever increasing number of women in industry and business it is important. Several surgeons with unusually large experience in breast diseases have recently told the writer that they have seen no breast cancers which they could fairly consider as due to trauma. Lane-Claypon, of the British Ministry of Health, after an elaborate study of 500 breast carcinomas in women compared to 500 noncancerous breast diseases in women concludes that in injuries, both with and without bruising, there is a close association between the injury and the subsequent development of cancer.

Coley[1] reports 37 cases of breast carcinoma and 2 of sarcoma with antecedent injury. A study of the case histories reported by both Lane-Claypon and Coley shows many cases which these authors themselves probably do not consider convincing. However, there are several which should convince any impartial observer that at least it is possible for a single blow to cause breast carcinoma.

The following case illustrates a definite traumatic history immediately preceding and leading up to carcinoma of the breast.

[1] Coley, W. B. *Loc. cit.*

L. F., aged thirty-eight, while walking along a sidewalk, was hit in the upper mesial portion of the right breast by a hard-hit baseball. She suffered pain immediately and ecchymosis appeared shortly. She felt she had suffered a serious injury to the breast. There was some swelling immediately after the accident which persisted.

I saw her three months after the injury. At the exact site of the injury there was a well defined hard, slightly tender mass, 4 cm. in diameter. No skin adherence over it. Mass movable on deeper structures. Upon operation, examination of the mass proved it to be well encapsulated adenocarcinoma of the breast.

The woman subsequently died with metastases to the chest and abdomen. (Personal communication from B. J. Lee.)

Therefore, in a breast carcinoma case at litigation the possibility of true relation should be accepted as a general principle and the facts in the individual case should be carefully weighed according to the principles noted by Segond.

3. *Injuries to the Thoracic and Abdominal Viscera.* In the thorax the only viscera needing consideration are the lungs. The possibility of external trauma, through the bony chest wall injuring the lung sufficiently to cause trauma, seems too remote to need discussion. The alarming increase of primary lung carcinoma in recent years may later be important as an occupational disease in those exposed to gasoline, coal tar, etc.

Injuries to the abdomen are also a very remote possibility as the cause of carcinoma but they cannot be dismissed entirely as in the case of the thorax. They must be considered if for no other reason than that they are not infrequently brought into court, no matter how grotesque they may be. A German court found for a man who once fell flat on his abdomen on a boat deck. Five years later he developed an intra-abdominal cancer. Such an affair belongs more to a comic opera than a court of justice. In the writer's experience, a man slipped off the step of a switch engine and sprained an ankle so slightly that he did not have to stop work. Sometime later he developed a carcinoma of the rectum for which he solemnly brought suit as caused by the sprained ankle. In the case of another man a rectal cancer in the course of its natural progress perforated and set up a fatal peritonitis. His widow brought suit because a few weeks previously he had slipped on his employer's floor. Fortunately in both these cases the good sense of the Pennsylvania referees ended these affairs, but only after unnecessary waste of time and money by the State, the defendant companies and the plaintiffs and their lawyers. These cases, of course, should never have gone beyond an honest family physician.

Yet Coley was apparently convinced by an abdominal case as follows:

A man aged thirty-five, always well. In December, 1909, in a train collision, he received very severe and extensive contusions principally of the head, spine, and lumbo-sacral regions. In bed four and one-half weeks. About three months later Coley saw him and found, principally, marked rigidity of the upper abdomen and loss of 65 pounds in weight. Six months later loss of 5 more pounds, cachectic, emaciated, and feeble, upper abdominal rigidity still present and in addition a tumor in the epigastric region. Death nine months after injury. Autopsy showed extensive carcinoma involving practically all the abdominal organs but apparently primary in the liver. (The case never came to trial as the state law forbade a suit for damages "if the next of kin be an alien or non-resident.")

Even in this case there is of course no definite proof that the accident caused the cancer, but in all human probability it did so and probably any commission or court would so find and even the doctors should not disagree.

So that, even in the abdomen, we should admit a possibility of a single trauma causing cancer but the evidence should be weighed against the principles of Segond with special care and rigidity.

Aggravation of a Pre-existing Carcinoma by Trauma. It is accepted without question by scientific medicine that a reasonably severe trauma of any kind applied directly to a carcinoma may aggravate

it, make it grow more rapidly, and may hasten a fatality which is inevitable unless curative treatment can intervene.

Supposing that, after a severe blow on a carcinoma, it does grow more rapidly and the patient dies. Both sides to the argument should agree that death was inevitable but that due to the injury the death occurred several months or years earlier. As I understand it, compensation commissions have no power to divide the burden. They have no middle course but must find on the one hand that the death was due to the trauma and award complete compensation for a fatality when it is admitted that the only thing the trauma did was to produce the fatality at an earlier time, the length of which cannot possibly be even approximately determined. In other words the inevitable end-result is sold to the employer simply because it came more quickly. On the other hand, if the commission feels that the end result should not be sold to the employer, the claim must be dismissed completely. Either decision is bound to work an injustice to one party or the other. It would seem that in such cases the law should allow the commission to reach a compromise decision by which the employer does not have to pay a death claim in full but such smaller amount as seems to the commission fair in view of the facts in each of such special cases.

Ewing[1] says, "Hence it is a safe conclusion that trauma very rarely produces cancer de novo." This is, of course, an admission that it is possible.

Coley in his conclusions says, "that a single local injury may cause a carcinoma as well as a sarcoma is no longer open to question." I hope enough has been said herein to confirm this view and make it generally accepted as a possibility.

In the face of the equally well demonstrated rarity of such a definite connection the difficulty is properly to evaluate each individual case. A careful comparison of the individual facts to Segond's postulates should lead to a just decision and it might be well if they were established by statute as has been done by some states in the similarly vexed question of hernia. The authenticity of the trauma, the severity of the trauma, the prior integrity of the part and the exact correspondence of the tumor to the site of injury should generally be readily determined.

The time element is one of the most difficult problems and unfortunately one on which the medical adviser may be unable to offer definite help. If a definite tumor is felt at or immediately after the accident, it of course was there before. If it is first noticed after two or three weeks, the connection becomes more trustworthy. The period of greatest probability may fairly be considered to be one month to two years. However, a definite distal limit cannot be fixed, as witness the man aged seventy-four who developed a carcinoma in the scar of an amputation done in childhood. If a visible scar is present or if it is considered proven that a definite thickening or lump remained from the injury to the appearance of the carcinoma, the time element loses considerable of its importance. For instance, we would rarely consider twenty-two years as within the range of possibility. Yet Lane-Claypon reports the case of a woman who struck her breast against a bed post in 1900. She was quite sure there was no lump then, a hard painless lump appeared "soon" afterwards. In 1922 the lump began to grow, that is, developed into carcinoma. If the facts were truly as alleged and if the early lump was at the exact point of injury, it is evident that permanent deep-seated scar tissue formed and became malignant twenty-two years later and that under these circumstances the blow should fairly be considered as the cause of the carcinoma. Lane-Claypon reports a still more convincing case with an interval of eleven years.

It seems, therefore, that the medical profession must agree that it is impossible to set a definite distal time limit.

[1] Ewing, J. The Relation of Trauma to Malignant Tumors. Am. J. Surg., 40: 30, 1926.

CHEMICAL BLOOD CHANGES

PRODUCED BY OBSTRUCTIVE LESIONS OF THE UROGENITAL TRACT*

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THE study of chemical blood changes produced by obstructive lesions of the urogenital tract was undertaken for four important reasons.

1. Nash and Benedict have reported experimental evidence indicating that the kidneys are the site of ammonia formation. If this be true, it appeared probable that obstructive lesions beyond the kidney would lead to an accumulation of ammonia in the blood, whereas renal disease would not be accompanied by ammonia retention. Bilateral and unilateral ureteral ligations with ureteral bisection were produced in rabbits, and the chemical changes resulting in the blood were contrasted with those observed following unilateral and bilateral nephrectomies.

2. In a previous communication we have emphasized as a guide to therapy the practical value of determinations of the calcium and inorganic phosphorus of the blood serum. Variations in the calcium and inorganic phosphorus of the blood serum have been studied in these animals, after nephrectomies and ureteral ligations, and these variations have been associated with changes in the acid-base balance of the blood.

3. With the object of completing the picture of blood changes due to obstructive lesions in the urinary tract, variations in non-protein sulphur and inorganic sulphates have been studied in conjunction with the retention of non-protein nitrogenous compounds. These components of the blood have been included in our investigation in order to gather more knowledge concerning the toxic factors producing what is commonly called "uremia."

4. Medical literature within the last five years contains many references to indican as an etiological factor in the production of nephritis. It was of importance to determine whether the indicanemia observed coincident with nitrogen retention is due to increased production or deficient excretion. Observations of the indicanemia after experimental urinary obstructions serve to answer this question. The results obtained in these experiments have been applied to the interpretation of the chemical blood changes in human cases.

All of the experimental surgery was conducted under strict aseptic precautions, the technique employed being identical with that adopted in the operating room. To assure complete ureteral obstruction, the ureters were ligated and bisected, in some animals close to the bladder and in others close to the kidneys. Histologic studies of the kidneys following all operative procedures are in progress and will be reported in a subsequent communication. A post-mortem examination of the animals was made to verify the thoroughness of the operative procedures, as well as to exclude extraurinary factors producing toxemias. No postoperative abdominal infections were observed in any of the twenty animals studied; two, however, developed pneumonia.

Control specimens of blood were obtained from ear veins, and in these samples ammonia nitrogen was found in only three instances. The occurrence of ammonia in these samples was due to ammonia production during the unusually long period of drawing the blood. When the animals after operation presented toxic symptoms attributable to nitrogen reten-

* Read before Section of Genito-Urinary Surgery, New York Academy of Medicine, April 18, 1928.

tion, they were etherized and blood was drawn from the inferior vena cava at the level of the renal veins. One rabbit with bilateral ureteral ligation near the bladder, and another with unilateral ligation close to the kidney, showed an increase in blood ammonia nitrogen after obstruction. In the remaining rabbits no ammonia nitrogen was found in blood following ureteral obstructions. Bilateral or unilateral nephrectomies did not increase the ammonia nitrogen of the blood. However, it is of interest to note that one rabbit from which both kidneys were removed showed at the time of death 1.0 mg. of ammonia nitrogen per 100 c.c. of blood. Post-mortem examination revealed an extensive pneumonia. This observation indicates that ammonia may be produced elsewhere than in the kidneys. From these experiments it was seen that ureteral obstructions in rabbits did not produce an accumulation of ammonia nitrogen in blood.

Ureteral ligations and nephrectomy were followed by a rise in the inorganic phosphorus of the blood serum accompanied by a fall in the alkaline reserve of the blood plasma. These respective changes in the blood are not proportional; consequently, for an adequate knowledge of the acid balance of the blood in this type of acidosis, both the inorganic phosphorus and the carbon dioxide combining must be known. Acidosis coincident with renal impairment results from a failure to excrete phosphates and from their neutralization by the plasma bicarbonate. Alkaline phosphates thus formed precipitate the blood serum calcium and when the Ca-ion concentration is diminished the neuromuscular system is rendered more sensitive to stimuli. The fall in blood serum calcium was not always proportional to the rise in inorganic phosphorus. It was not possible to demonstrate any dependence of the length of life of the animal upon the nitrogen retention; however, the development of spasms or convulsions terminating in death are dependent directly upon the reduction of the calcium of the blood serum. The reduction of the blood serum calcium may be obviated by calcium feeding. From a prognostic point of view determinations of blood serum calcium are of prime importance.

After nephrectomy and ureteral obstructions the non-protein sulphur and sulphates of the blood are increased. This rise in sulphur compounds appears to be due to a failure of excretion rather than to an increased production. Variations in non-protein sulphur are much less than the changes in non-protein nitrogen. A very definite indicanemia is demonstrated in these animals as well as in human blood after urinary obstructions. We believe these results indicate that an indicanemia is not the cause but rather the result of a nephritis.

The toxicity of retained catabolites in the blood stream will depend partly upon their diffusibility through cell membranes and their ability to enter cells. The relative diffusibility of urea and creatinine through separating membranes has been studied by a comparison of their concentration in blood and in ocular fluids. It has been found that urea readily penetrates into ocular fluids, but only 30 to 50 per cent of the blood creatinine finds its way into these body fluids.

TREATMENT OF
BLADDER PARALYSIS
DUE TO NON-TABETIC SPINAL CORD LESIONS*

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IN conditions causing a paralysis or destruction of the spinal cord, there is an immediate beginning retention of urine. This retention continues until the bladder is greatly distended and shows in the lower abdomen as a large ovoid tumor. Up to the period of the War and since then, in large numbers of cases, relief from this retention is by catheterization. In these cases catheterization done at regular intervals for relief is usually, in spite of care, sooner or later followed by infection of the bladder. Infection of the bladder becomes one of the most serious conditions in these paralytics, and there is frequently a train of symptoms: ascending urinary infection, dilation of the ureters and pelves of the kidneys, a large frequency of calculus formation and a large percentage of deaths from infection and pressure atrophy of the renal parenchyma.

The following is a typical case report from the autopsy records at Presbyterian Hospital:

A young man with a fracture of the lower dorsal spine following an automobile accident in 1925 and with paralysis of lower limbs and urinary retention, was treated by catheterization. He had a decompression of the site of fracture shortly after injury. He developed urinary infection, bilateral pyelitis and recurrent calculus formation. After two years he died of renal secretory failure with infection. At the time he had well recovered from the paralysis of his lower limbs. Autopsy showed dilated, infected bladder, dilated ureters, infected pelves and calyces. The kidney cortex was thinned out like paper.

Goltz in 1874 showed that micturition in a dog is a reflex with the center in the second and fifth lumbar segments and that after destruction of the cord the bladder emptied itself automatically with the aid of external stimuli. Mosso and Pellacario in 1882 showed that the pressure of urine alone caused sufficient stimulus to cause the automatic emptying of the bladder, but that it was aided by psychic or external sensatory stimulation. There are two motor sources of nerves to the bladder; (1) in the second to the fifth lumbar segments through the sympathetic chain and inferior mesenteric ganglia and hypogastric nerves to the bladder, and (2) in the second to third sacral segment through the nervus erigens. Stimulation of the first produces weak contractions and of the second strong contractions of the bladder.

The emptying of the bladder is part involuntary and part voluntary. The emptying of the pelves and ureters has been shown by Engelmann to be due to pressure accumulation in the pelvis and upper ureter and the wave runs down apparently from muscle cell to muscle cell.

After destruction or paralysis of the cord in man there is still retained in the bladder the power of contraction, and if properly stimulated the bladder will in time gradually assume the power automatically to relieve itself. Before, but mostly during the War, on account of the great increase of spine injuries from war causes, this principle was made use of and the bladders of those with spinal paralysis were allowed to fill, to overflow and slowly to assume the automatic emptying by degrees, and they were not supposed to be catheterized. Since then there have been various means

* Read before Section of Genito-Urinary Surgery, New York Academy of Medicine, April 18, 1928.

suggested to help. Young, in addition to advising automatic emptying, recommends at times his decompression apparatus. Others advocate suprapubic drainage, taking the cue from the two stage prostate. In the latter it has been shown that it is necessary to keep the wound open, for those cases without obstruction to the normal vesical outlet tend to close their suprapubic opening, unless it is kept open by mechanical means.

Since the War we have not catheterized those cases of cord paralysis with resulting urinary retention but have allowed the bladder to fill for twenty-four hours or more and then forced the relief of the bladder by pressure excited upon the fundus. This has been advocated and used by others previously and has been quite successful in our cases. After the bladder has filled so that it is clearly and easily felt, the right or left hand was placed sidewise across the fundus and the ulnar side pushed above the fundus as far into the abdomen as possible. The fundus was then cupped or grasped and pressure exerted by pushing down against the pelvic opening. The urine did not come out until after one or two minutes of pressure and then would be voided in a small irregular stream. It was usually possible at first to press 4 to 5 ounces from a bladder containing about 20 or 30 ounces. Pressure was then applied every two hours and each time the amount obtained slowly increased and the pressure required gradually decreased. At this stage the two hour intervals were delegated to the nurse. It has usually taken six to ten days before the bladder emptied well behind the symphysis and several weeks before there was almost complete emptying. During this period there are symptoms of urinary retention: coated tongue, slight nausea, some temperature and at times slight mental changes. In all cases we have found a rise in the blood urine constituents. The highest seen was a case at Bellevue with a blood urea of 75 mg. per liter on the ninth day. The blood urinary constituents fall with the recovery of the emptying power of the bladder.

When possible the patient has been taught to feel for the fundus and has been instructed how to apply the pressure himself and some have been able to hasten the emptying by applying their own increase of abdominal tension by breathing.

When the bladder took over its automatic emptying, its capacity diminished so that it did not distend to carry over a long period without dribbling and several cases required the use of an incontinence apparatus.

There were patients in whom catheterization had already been instituted. If there was little or no infection, catheterization was stopped and the bladder allowed to fill and pressure applied as described. This is not without danger for if the bladder wall proves to be more inflamed than thought, traumatism of the bladder wall is easy and produces serious consequences. Under no circumstances should the bladder be pinched or "Credéd" as the following case illustrates:

A young man admitted as transfer from another hospital had a lumbar spine fracture with paralysis of the lower extremities of twelve days' duration and had been catheterized during that time to relieve his urinary retention. Expression was attempted by pressing on full bladder with fist and then squeezing the fundus. This was partially successful but was followed by patient's becoming worse, running a septic temperature and death. Autopsy showed a general peritonitis from a small perforation through an infected bladder.

If the infection is not severe pressure has been done every two hours, as described, with catherization and irrigation of the bladder once a day. In the last case of this type the catheterization was stopped after two weeks because the residual urine had dropped below 100 c.c. and with urinary antiseptics and the patient almost emptying his own bladder, he compensated very well. This case was an extramedullary cord tumor and, possibilities of recovery of function in his limbs being fair, it was

necessary to prevent any serious urinary disturbance.

It has been found easier to empty the female bladder by pressure than the male, due, I think, to the short urethra, the wide pelvis and the softer abdominal muscles which allow better handling of the bladder. However, it was harder to obtain cooperation from female patients as far as instructing them to apply their own pressure. They apparently had more severe breaks in morale and that in addition to less muscular strength in the arms and hands made them less persevering.

In cases of cord destruction in the low cervical region with priapism, pressure has been more difficult to bring to a successful result at first, but as priapism subsided and if patience was expended, there was a more rapid automatic control on account of the height of the lesion.

Bladder infection has been known to occur in these cases even though they are not catheterized. Although we have not seen infection occur, the treatment still should be the use of pressure to bring about the automatic emptying.

From our experience we believe that pressure properly applied to the bladder in a retention from spinal injury, hemorrhage, tumor or other lesion, brings about an automatic emptying of the bladder in time and should prevent infection to the bladder and its attendant complications.

URETERAL OBSTRUCTION IN INFANCY*

MEREDITH F. CAMPBELL, M.D., F.A.C.S.

NEW YORK

URINARY tract infection in infants as in adults is perpetuated by faulty drainage. While an occasional transient infection without obstruction may be encountered, the protracted infections are usually associated with obstruction, and permanent clinical cure is rarely attained without obliteration of this blockage. In a recent study of 2420 pediatric cases coming to autopsy at Bellevue Hospital, we found ureteral blockage in 47 or approximately 2 per cent of the total. Urinalysis or post-mortem examination revealed infection in four-fifths of these, and from this observation we may infer that about 1 in 50 of all children suffer from some form of ureteral obstruction. In many cases this may account for chronic urinary infection or recurring attacks of so-called acute pyelitis.

Most pediatricians believe that the so-called acute pyelitis of infancy is usually a self-limited disease, running its course within a period of two to three weeks. While the majority of these acute renal infections terminate favorably within this time, there is a large group in whom the pyuria and signs of renal infection remain, resisting all forms of the commonly employed but rather empirical therapeutic measures. Unquestionably, in many of these the acute disease represents an exacerbation of an asymptomatic chronic infection and is reciprocal with the degree of urinary obstruction. There is still another group in whom the onset of the urinary infection is insidious, often dating from birth, and in whom the disease remains obdurate. Urological study reveals an obstruction as the underlying lesion in most of these infants; ureteral blockage of one type or another is found in a surprisingly large number of children with chronic pyuria.

We are herewith presenting a clinico-pathological study of 74 cases of ureteral obstruction in infancy and early childhood. In many instances the obstructing lesion was not discovered until autopsy; in others the site and nature of the obstruction was determined by urological examination, and some cases of the latter group have been followed through to post-mortem diagnostic confirmation.

NATURE OF URETERAL OBSTRUCTIONS

Etiologically these lesions may be classified as congenital or acquired, but we prefer to designate them as intraureteral or extraureteral, since upon the intrinsic or extrinsic character of the obstruction depends in a large degree the type of surgical attack. Chief among the obstructions of and within the ureter itself are strictures including valve formations, calculi, kinks, ureteral reduplication, abnormal ureteral insertions, renal ectopy, ureteral spasm, intraureteral cysts, and blockage by the debris of renal necrosis. Of the extraureteral compressions, aberrant vessels, periureteral sclerotic bands and extraureteral inflammatory or neoplastic masses merit greatest consideration.

INTRAURETERAL OBSTRUCTIONS

Strictures. These lesions, whether congenital or acquired, constitute the majority of ureteral obstructions in infancy. Congenital strictures are not uncommon and occur most frequently at the two ends of

* From the Departments of Pediatrics, Urology, Pathology and Children's Surgery, Bellevue Hospital, Doctors C. H. Smith, A. R. Stevens, Douglas Symmers and C. G. Burdick, Directors respectively. Read before Section of Genito-Urinary Surgery, New York Academy of Medicine, May 16, 1928.

URETERAL OBSTRUCTION IN INFANCY: 74 CASES*

AGES OF PATIENTS

Under three months	16
Three to five months	13
Six to eleven months	10
One to two years	9
Two to four years	10
Four to six years	8
Over six years	8
	74

	Determined by			Side Involv.			Location		
	Autopsy	Urological Examination	Total	RT	LT	Bilat.	UVJ†	UPJ‡	Body
Intraureteral									
Stricture	25	18	43	19	16	8	31	13	6
Calculi									
Uret.-pelvic junct	2	..	..	2	..	..	..	2	
Filling pelvis and blocking ureter	2	..	..	2					
In lower ureter	1	1	6	1	1	..	..	..	2
Kink	..	1	1	..	1				
Reduplication	1	1	2	2					
Idiopathic (neurogenic)	7	1	8	4	4				
Tumor	2	1	3	1	2	..	..	..	3
Tuberculosis	1	1	2	1	1	..	..	2	
Hemorrhagic disease of new-born, clots firmly plugging ureter	1	..	1	..	..	1	1		
Extraureteral									
Aberrant vessels	1	1	2	2	..	..	..	2	
Abnormal ureteral insertion	2	..	2	1	1				
Renal ectopia	2	..	2	2					
Enlarged lymphnode	1	..	1	1					
Obstruction by vas deferens crossing	1	..	1						
	49	25	74	38	26	9	32	19	12

* Ages range from seven month fetus to six years; over 80 per cent were under two years.
† Ureterovesical junction.
‡ Ureteropelvic junction.

the ureter, the ureteropelvic or ureterovesical junctions. On the other hand, any portion of the duct may be involved. In 22 per cent of our patients the blockage was bilateral, and in one instance this condition was seen in a seven month fetus. In half of our cases the strictures were multiple; we have not observed more than 3 in the same ureter, however.

By some these obstructions are regarded as merely mucosal redundancies but in many lesions suggesting this condition, histological section has revealed marked submucosal and mural scarring. However, we have observed certain cases presenting areas of mucosal redundancy and valve formation in which horsehair filiforms were the only probes which could be passed through the obstructions. In any event, renal infection and destruction occur whatever may be the histological nature of the atresia. How many ureteral strictures in infancy are primarily of inflammatory origin we cannot estimate. The frequent association of exacerbations of urinary infections and acute focal infections elsewhere seems, in some instances, to harmonize admirably with Hunner's interpretation of this association in adults. He believes that frequently the focal ureteral sclerosis

is secondary to focal infection elsewhere (teeth, tonsils, sinuses particularly) and that acute flare-ups of the primary foci

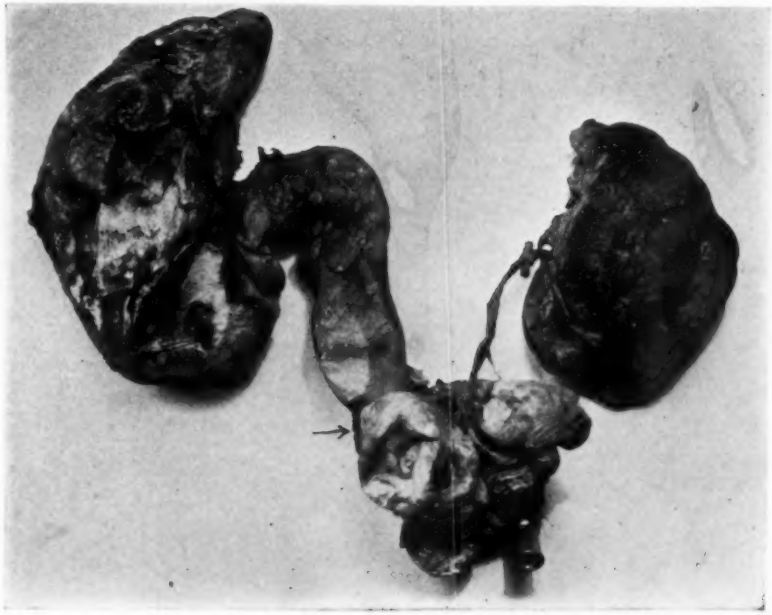

FIG. 1. Hydropyoureter and hydronephrosis in male aged four months. Dense tight stricture 1 cm. above ureterovesical junction. Child admitted to hospital with marked pyuria and died on the second day.

incite congestive flare-ups in the ureteral infiltration, resulting in an acute ureteral obstruction. He believes that some cases of ureteral stricture are not clinically cured until diseased tonsils, for example, are removed.

That ureteral stricture may have its incipiency in infancy in some cases is suggested by the following observation:

J. D. male, aged seven months, developed an acute otitis media followed in a few days by marked pyuria (clinical pyelitis). Autopsy revealed a bilateral renal focal suppurative nephritis and acute granular ureteritis. In the left ureter about 2 cm. below the ureteropelvic junction, a granulating ulcer 1 cm. long and extending well into the submucosa was found.

The sclerotic healing of such a ureteral lesion might conceivably give rise to clinical stricture of later years. In another instance a unique pathological lesion was found at autopsy:

The patient, a male aged one year died of uremia. There was neither left ureter nor kidney. The right ureter opened near the midline and presented a dense stricture 2 cm. from the bladder. Above this point there was marked dilation with infection. The kidney was a trilobular organ much like a three leaf clover in appearance and showed a thin rim of scarred cortex with three enormously dilated and infected pelves.

Calculi. Stone formation is favored by urinary stasis and is most often associated with obstruction. It is generally thought that the majority if not all of ureteral stones are formed in the kidney pelvis and have become lodged in the ureter during descent. Over ninety per cent of these will pass into the bladder. While urinary calculi are not uncommonly found in infants, they are least often encountered in the ureter. A large pelvic calculus blocking the ureter was found post mortem in 2 cases and small stones were found jammed in the ureteropelvic outlet in 2 others. In another autopsy case a large stone blocked the lower ureter, and in a patient examined urologically two small stones were demonstrated in and removed from this location.

Special interest attaches to the case

observed clinically since the diagnostic and therapeutic methods employed were identical with these procedures in adults:

Kinks. Obstruction by acute ureteral angulations are associated chiefly with nephroptosis and renal ectopia. Usually

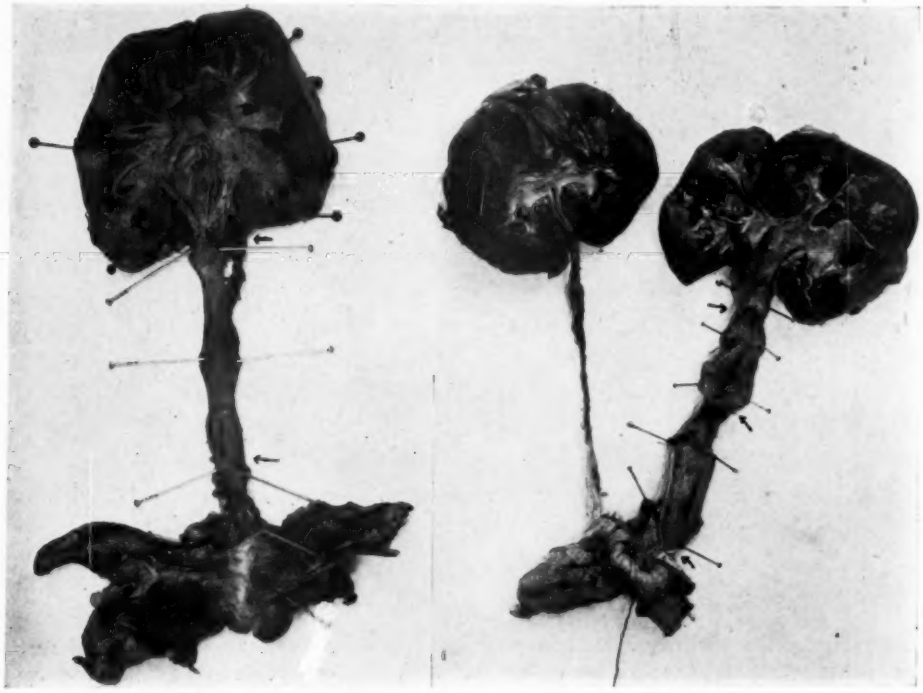

FIG. 2. FIG. 3.

FIG. 2. Two ureteral strictures (presumably congenital) in male of eight months. Infected hydronephrosis demonstrated by urological examination two months before death (pneumonia).

FIG. 3. Marked dilation and infection of both ureter and renal pelvis in female of six months. Pyuria and fever were the outstanding clinical features. Three strictures are indicated. Probe in vesical outlet. Opposite kidney and ureter normal.

A. U., female, aged two years, admitted for pyuria of two months duration. Roentgenogram negative. Cystoscopy revealed a small stone in the bladder (estimated 6 mm. diameter), many pus cells in urine from left ureter. Pyelogram revealed two negative shadows in left ureter. (Uric acid stones cast no roentgen-ray shadow and hence appear as vacuoles within the pyelographic injection.) One week later a wax bulb catheter was passed up left side and withdrawn with twisting motion, the diagnostic scratch of stone being obtained on the wax. Left ureter dilated by passing up two No. 5F. catheters side by side. Three weeks later no stone was found in bladder, no scratch on wax; moderate ureteral dilation was shown in pyelogram but no urographic indication of the previously observed calculi. We were obviously dealing with three uric acid calculi all of which were eventually passed.

the site of blockage is at or near the ureteropelvic junction; a large hydronephrosis above and a relatively normal ureter below is the characteristic finding. Clinically we have recognized this lesion but once in infants, but include 2 cases associated with ectopia revealed by autopsy. In the case so diagnosed the kinking was an accessory lesion, the primary disease being marked bladder and upper urinary tract dilation and infection of neurogenic origin in a female six years of age.

Ureteral Reduplication. If there is complete reduplication (two kidney pelves and two ureteral orifices on the same side) obstruction at the point of ureter crossing in the pelvic cavity just above the bladder is said to occur rarely. We have not

observed such a case. If the reduplication is incomplete—a bifid ureter—obstructive atresia of one of the branches is occasionally observed, most often at the site of bifurcation. In one such case examined urologically, the true condition was not recognized but was subsequently disclosed at operation.

Fig. 4. Dense ureteral stricture at ureterovesical junction in female seven months old. Persistent pyuria indicated urological examination which revealed marked dilation of ureter with infection and diminished renal function. Striking improvement following ureteral dilation. The weight which had been stationary for some weeks immediately showed a steady gain.

Fig. 5. Ureteral stricture at vesical junction with dilation, infection, and diminished renal function. The patient, a female aged thirteen months, showed marked improvement following dilation of the obstruction.

E. H. aged five years, female. Chief complaint, chronic pyuria and pain in right side. Roentgenogram negative. Ureter catherization revealed functionless right kidney, left normal. Pyelogram showed right pyonephrosis. Nephrectomy advised but reëxamination requested. Right ureter specimen on reëxamination showed quite normal urine and good renal function. Pyelogram showed a small smooth-walled lobular pelvis. Pelvic lavage carried out for a few times but without improvement. Nephrectomy revealed a double kidney pelvis and upper ureter reduplication with a normal kidney pelvis above, pyonephrotic pelvis below.

Abnormal Ureteral Insertion. This may be high into the kidney pelvis with marked angulation or a lip valve formation which obstructs renal drainage. There may be ectopic insertion into the bladder, urethra, vagina or rectum. We have seen cases of the latter type but never with evidence of obstruction. We include in our series 2 cases of the former type (ectopic renal insertion) with obstruction observed at autopsy.

Neurogenic Obstruction. The syndrome of ureteral spasm as a cause of chronic obstruction in the ureter is not well understood. Braasch and others have described

such lesions in adults but the mechanism is still undetermined. The lesion is predominantly unilateral and sphincteric spasm is

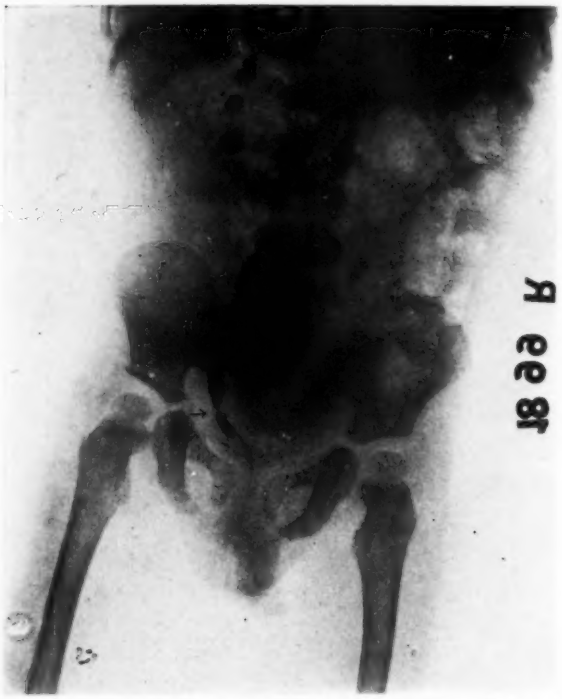

Fig. 6. Ureteral spasm. This condition is frequently and erroneously diagnosed by urography as ureteral stricture. In this case there was no obstruction demonstrated by urological examination nor in other pictures taken at the same time nor in those taken at a subsequent examination. The patient was a female aged four years.

most intense at the ureterovesical or the ureteropelvic junction. In our series we have 8 such patients presenting a greatly dilated ureter and kidney pelvis on one side without organic obstruction. In 7 of these the condition was determined by autopsy. In 1 instance the diagnosis was arrived at by urological examination, although neurologically no evidence of cord disease was revealed. We assume these cases to fall within this category.

Other Types. Intraureteral cysts blocking the ureter have been reported by some observers. Blockage may be present in cases of neoplastic or tuberculous renal disease but is always secondary. We have observed 3 cases of secondary neoplastic and 2 of tuberculous obstruction. Acute obstruction may result from the passage of blood clots or necrotic debris but this clinical finding is indeed rare in infancy. In a patient aged three days dying of hemorrhagic disease of the newborn, autopsy revealed firm plugging of both lower ureters by blood clots with moderate dilation above.

EXTRAURETERAL OBSTRUCTIONS

Aberrant Vessels. Ureteral obstruction by pressure of anomalous accessory vessels is always of great clinical interest in adults and when encountered in early life is an even more striking observation. These aberrant vessels most frequently pass from the lower renal pole to the aorta or vena cava but Hyams and others have recently described cases of ureteral blockage due to anomalous vascularization associated with the iliac vessels. Schreiber found the uterine artery obstructing in 1 instance. Chronic pyuria and loin pain are the usual symptoms. Palpation frequently reveals a renal mass often showing marked variations in size (emptying of hydronephrosis). During the past two years we have observed 7 such cases at operation, 6 of which were adults. In all a history of long standing pain was obtained, dating from early childhood in 4 instances. Curiously, these patients had noted as children that great pressure applied to the loin gave temporary relief. Unknowingly they had mechanically reduced the intrarenal pressure by partially emptying a tense hydronephrotic sac. In our pediatric series we have observed the condition twice, one found at autopsy and the other, a female aged six years, was diagnosed by urological examination and nephrectomized. This latter patient complained of right loin pain, intermittent colics and persistent pyuria. At the age of three years an appendectomy had been performed during one of these acute attacks.

Extraureteral Masses. These are predominantly inflammatory or neoplastic in character. In 1 case recently examined by us, an enormous renal embryoma completely blocked the ureter 4 cm. from the

bladder. Others have observed ureteral blockage by various abdominal growths as well as by suppurative processes such as appendicial abscesses. In a patient four years of age dying of lymphatic leucemia, autopsy revealed acute ureteral obstruction caused by an enlarged retroperitoneal lymph gland.

Fig. 7. Two negative shadows cast by uric acid calculi in female child of two years. A small stone was also present in the bladder. Ureteral specimen showed infection and diminished renal function. Scratch obtained on wax bulb catheter. Calculi passed following ureteral dilation.

Fig. 8. Ureteral angulations giving rise to kinks. In this case, a "cord bladder" in a female of six years with marked urinary tract dilation and infection, these kinks were of little clinical importance. This patient died six months later of uremia.

Periureteral Scars. Bands of scar crossing or otherwise compressing the ureter have been observed. In 1 of our patients, aged five months, a dense ureteral stricture was found where the vas deferens crosses the ureter. The vas at this point was firmly bound to the ureter although there was no other evidence of deferentitis. Of extraureteral compressions, aberrant vessels are of greatest importance and interest.

CLINICAL CONSIDERATIONS

In the presence of ureteral obstruction in infancy as demonstrated clinically in this study, chronic pyuria is the most constant finding. Evidence of loin pain map be present and in some cases palpation may reveal a renal mass. Often the onset is acute, frequently preceded by an acute focal infection (tonsillitis, otitis, pneumonia, etc.) but the urinary infection does not clear up within the usual time. In some of our patients pyuria had been noted since birth. In a few of these coming to autopsy, congenital ureteral obstruction with associated infection was found.

Hematuria, urinary frequency, dysuria, ureteral colic or dull aching loin pain with or without radiation are chief of the evident symptoms. Gastrointestinal upsets, vomiting particularly, may be outstanding and tend to misdirect the attention from the primary urinary disease. The temperature and pyuria reflect in a large measure the degree of obstruction. If the obstruction permits ample drainage, there is usually little or no fever; pyuria may be marked. With increased obstruction, urinary absorp-

tion results in chills and fever and the urine frequently becomes quite normal in gross appearance. As previously noted,

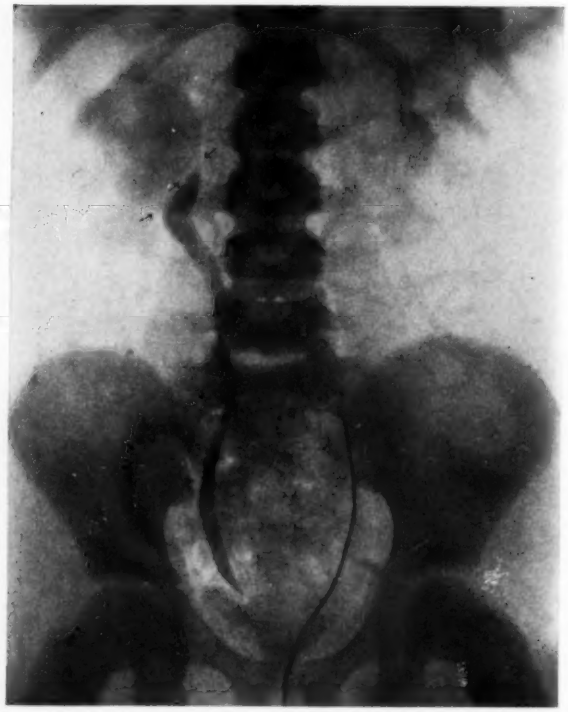

FIG. 9. Hydropyonephrosis with functionless kidney due to ureteral obstruction by an aberrant vessel in a female of six years. The course of the anomalous vessel is indicated by arrows. Because of the marked compression at this point there is no sodium iodide within the ureter, thus outlining by contrast the upward course of the artery. Nephrectomy.

recurrent attacks of clinical pyelitis undoubtedly indicate obstruction. This syndrome is quite generally recognized in adults and in many instances the acute flare-ups do not cease until normal ureteral drainage is established.

PATHOLOGY

Dilation, infection and renal destruction characterize the pathological picture of obstructive urinary lesions. Above the point of obstruction dilation is most marked but inflammatory dilation is not uncommonly seen below this point. In many cases the ureter is found to be dilated ten to fifteen times its normal size, thickened and atonic; the renal parenchyma may be but a sclerotic shell about an enormous hydronephrotic kidney pelvis. Upon the degree of renal destruction depends the prognosis, and treatment is directed towards the prevention of further renal damage.

UROLOGICAL DIAGNOSIS

Obliteration of the infection being the clinical problem, the services of the urologist may be employed advantageously to localize and obliterate the obstruction. Cystography, cystoscopy, ureteral catheterization, renal function tests and pyelography are utilized exactly as in adults.

Before subjecting these patients to cystoscopy we obtain certain data in all cases. Except for hematuria, tumor or colic, we do not consider instrumentation in these infants with persistent infection until the disease has resisted intense medical treatment four to eight weeks and focal infections have been eradicated as far as possible. We believe bloody urine indicates immediate cystoscopy except, of course, in cases of hemorrhagic nephritis. In those patients in whom urological examination is to be carried out, a plain roentgenogram is made to rule out calculus shadow and spina bifida. A cystogram is made to determine the contour of the bladder and the degree, if any, of ureteral or urethral reflux. Blood pressure readings, one or more two hour phenolsulphonphthalein tests, blood urea and creatinin estimations and complete urinalysis including culture are included in our routine examination.

This data having been obtained and indication found, the child is cystoscoped, with or without anesthesia, according to the age and temperament of the patient. We prefer the open drop method. As a rule less than an ounce of ether is required; the anesthetic is stopped as soon as the instrument is passed into the bladder. We have cystoscoped and pyelogrammed some six year old girls without an anesthetic. If a child is caused pain, instrumentation is impossible. It should be noted also that instrumental reactions are fewer and less severe in these young patients than in adults.

Bladder inspection and ureteral cathe-

terization with the collection of specimens for chemical, bacteriological and microscopical examination, together with intravenous functional dye test (we use indigo carmine) and pyelography, complete the examination. Pyelograms on the indicated side are made with 12 per cent sodium iodide. Rarely do we perform bilateral pyelogram; never do we make a pyelogram on an anesthetized child.

Frequently obstruction will be noted as the catheter is passed up the ureter; the distance up is recorded. In the presence of pyelographic evidence of ureter stone or stricture, these are checked up by passage of the wax bulb catheter for stone scratches or the small olivary bougie for "hang"—that peculiar resistance felt as the bulb is withdrawn through the stricture. By confining our examinations to those cases presenting the aforementioned indications, we have been able to disclose evidence of major urinary tract lesions in over 95 per cent of those patients investigated.

TREATMENT

With the relief of the obstruction most urinary tract infections will clear up. Ureteral strictures have been dilated with marked clinical improvement but bacteriological cure has been obtained in only 3 cases. Because of the small caliber of the urethra and cystoscopic instruments, ureteral dilation is best performed by passing two or more small catheters (No. 5F.) up the ureter side by side because one cannot pass the large bougies used in adults. In most cases we lavage the kidney pelvis with ⅕ per cent silver nitrate at the time of dilation. We feel, however, that clinical improvement results from dilation rather than from lavage. One patient, a female nineteen months of age in whom bilateral atresia of the ureters in the intramural portion had caused marked dilation and infection, had these obstructions cut through a cystotomy wound. Large catheters (No. 12F.) were left in each ureter for twenty-four hours to prevent immediate closure of the ureteral meatotomy.

In another instance previously noted, two calculi were removed from a two year old child by ureteral dilation. Nephrectomy was performed once for hydropyonephrosis secondary to aberrant artery obstruction and once for pyonephrosis associated with upper ureter reduplication. In all cases of this obstructive type, the greatest difficulty lies in making the diagnosis; the obstruction is removed only by surgical or mechanical methods.

While these surgical treatments (dilation, etc.) are being carried on, certain medical measures may be employed wisely. Water in abundance is the best medicine. Alkalies are of value only as they promote diuresis. We administer liberal doses of methenamine in conjunction with sufficient acid sodium phosphate to render the urine acid to litmus. A child of four years is given 7½ to 10 grains of each four times a day, this dose being diminished or discontinued with the advent of signs of urinary tract irritation. A child of two years is given half this dosage. In the presence of obstruction, however, the prime therapeutic consideration is the early establishment of free drainage.

SUMMARY

Ureteral obstructions in children, particularly congenital strictures, are not uncommon and may be the underlying cause of persistent urinary tract infections with marked renal destruction. As other authors have done, we wish to emphasize the similarity of these obstructive urinary tract lesions to those found in adults. By modern urological methods these lesions can be diagnosed clinically and treated surgically. Medical measures are of value only in conjunction with surgical procedures aimed at the relief of the obstruction. This type of disease in infancy affords problems which at times tax urological ingenuity severely but offers a field for clinical endeavor of unusual interest to the urologist and pediatrician. When the obstruction is recognized and treated early, these patients may be spared irreparable renal destruction and in many cases years of suffering or an early death.

CYSTOGRAPHY

AS AN AID TO UROLOGICAL ANALYSIS*

J. Sydney Ritter, M.D.

NEW YORK

CYSTOGRAPHY, although not a new procedure, has not been utilized as an aid in the diagnoses of urological conditions to the fullest extent.

The interpretation of roentgenograms can best be made when a thorough knowledge of the history of the case, together with the clinical findings, are at hand. We have been using roentgen-ray opaque solutions to demonstrate the bladder, followed with an airogram. A comparative study of these plates was found to be of great assistance in arriving at a diagnosis.

The dangers attributable to cystography such as air emboli, rupture of the viscus, hemorrhage or shock, we feel are somewhat exaggerated; nevertheless, these dangers should always be kept in mind and if reasonable precautions are taken they can be avoided.

During the past few years we have used cystograms as a valuable aid in urology because of their great assistance in determining:

1. The contour of the bladder.
2. Incontinence of the vesical sphincters.
3. Prostatic intrusion.
4. Diverticuli.
5. Functional ability of the ureterovesical juncture.
6. Roentgen-ray transparent calculi.
7. Extent of vesical neoplasms.
8. Fistulous tracts that may exist between the bladder and other organs.

Cystography alone will not make definite diagnoses of the above pathological conditions but is of great importance in confirming or eliminating these conditions.

PROCEDURE

After having done more than one hundred cystograms during the past two years, we have decided that it is advisable to use the following technique:

1. Have the patient void.
2. Catheterize the patient and estimate the residual urine.
3. Distend the bladder with boric acid solution, estimating the bladder capacity.
4. Empty the bladder and then inject an equal amount of 5 per cent sodium iodide solution.
5. Make a roentgen-ray exposure in the anteroposterior direction, a second exposure with a lateral shift of the tube and a third exposure with a shift to the opposite side. The shift plates are made to demonstrate any diverticuli that may exist posterior or anterior to the bladder, which would not appear if a direct anteroposterior exposure alone were made.
6. The patient is now requested to void and an exposure is made. This is to determine whether the patient has any residual urine or retention diverticuli. The bladder is now catheterized and emptied, air is injected to the capacity and exposure is made. This is done to outline tumor masses, prostatic intrusion and in some instances to show vesical calculi that are roentgen-ray apparent.

* Read before Section of Genito-Urinary Surgery, New York Academy of Medicine, April 18, 1928.

CHRONIC ABSCESS OF BONE (BRODIE)*

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NEW YORK

THE subject of chronic abscess of bone has always been a surgical entity which has aroused interest especially since the isolation of that group of cases which, originally having been described by Brodie in 1830, has since been known by his name. A literature of moderate extent has grown up around this disease and from time to time it has been reviewed by various writers (Thompson, Gross, Brickner, McWilliams, Bancroft, Dowd, Martin, Miller, etc.), each of whom has brought the subject up to his time. Any confusion which may have arisen in adequately classifying this entity among other surgical diseases of bone has apparently arisen from the ease with which the lesion has been confounded with chronic bone cysts and other similar conditions of neoplastic, bacterial or other origin and with the attempts which have been made to separate the lesion completely, especially in its pathological aspects, from the general subject of osteomyelitis. The purpose of this communication is to show the intimate relationships of chronic bone abscess with the subject of acute and chronic osteomyelitis in general and to indicate the classification of this type of lesion in that disease.

In several previous communications I have described the mechanism by which foci of acute osteomyelitis became established. This includes (1) a primary lesion, (2) a consequent bacteriemia and (3) the formation of a thromboembolic (metastatic, subsidiary) lesion within the confines of the vascular structure of any bone. The actual pathological process in the bone which develops at these fixation points is a thromboarteritis or thrombophlebitis. Great emphasis was placed in these various communications upon the dominating importance of the results of the consequent blockage of the vascular supply, which necessarily must follow the establishment of such thromboembolic lesions.

In classifying the manifold lesions which were formed by this mechanism, the various groups were found to follow anatomical lines and to become closely related to the location of the thromboembolic focus in the vascular tree of the bone. Lesions were described as (1) main stem lesions with total necrosis of the shaft between the conjugal cartilages, (2) primary branch lesions with necrosis of one-half of the shaft, (3) secondary or subsidiary branch lesions with necrosis of irregular segments of the shaft of the bone and (4) end-vessel lesions with localized foci of infection in the region of the metaphysis near the conjugal cartilage. These were main groupings; other atypical groups were found to be variations formed (1) by thrombophlebitic spreading of the original focus or (2) by changes which followed or were caused by operative interventions, the latter serving to mask the essential nature of the given lesion because of the artificial spreading of the thrombophlebitic lesion.

In following our cases of osteomyelitis we have been able to determine that cases of abscesses in bone tissue are clinically one of two varieties: (1) bone abscesses without history of any previous acute osteomyelitis, of slow and insidious development, and of prolonged course, and (2) those with a history of a previous acute osteomyelitis and with an intervening period of apparent well-being or forming simultaneously with the development of the attack of acute osteomyelitis.

The type of abscess in bone tissue described by Brodie does not correspond

*From the Mount Sinai Hospital, New York. Submitted for Publication May 19, 1928.

clinically with the last major group of bone abscesses. The latter are of common occurrence, begin as an ordinary case of

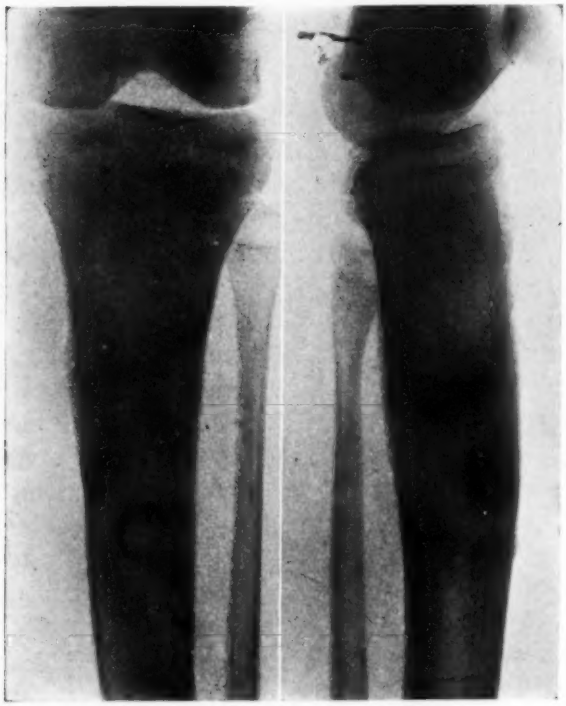

Fig. 1. A true Brodie abscess.

acute osteomyelitis, are of comparatively short history and of rapid development, occur anywhere in the shaft of the bone and most usually near its centre portion, are accompanied by fever, chills and other evidences of an existing bacterial infection, frequently perforate the cortex and form purulent collections under the periosteum or in the fascial planes of the limb, must usually be subjected to operation in which drainage forms the main objective and are commonly followed by sequestration of some part of the adjacent bone tissue.

Pathologically acute bone abscesses are accumulations of pus in the course of an acute thrombophlebitis of bone (osteomyelitis). The purulent collections are situated within the cancellous mesh or in the medullary cavity and within the endosteum. The margins of the abscess are always ill defined and there is no definite fibrous capsule. Within the medullary cavity the suppuration has a tendency to extend through its entire length; this is not always true, however, and abscesses sharply limited in extent are also found. Bone destruction is predominant. Bone production occurs late and pari passu with the separation and sequestration of the necrotic portions of the bone. Such undrained collections of pus may very rarely become chronic bone abscesses. Secondary abscesses also occur. These are residua and represent undrained pockets, or retention abscesses in the tracts of the various sinuses, or recurrences of infection.

The primary chronic bone abscesses, the classical description of which was given by Brodie, never have an acute stage. Their onset is insidious. They are often latent and exist for twenty to thirty years before discovery. The chief symptoms are pain in a limb, generally near a joint, increased at night and in changing weather, and in nearly all cases without fever, chills or other signs of bacterial infection. The tibia is most often affected.

Pathologically, the Brodie abscesses are always localized affairs in the metaphyseal region of a long bone near the conjugal cartilage. The signs of bone production are limited and usually correspond to a productive inflammation which results in a hypertrophic thickening of the periosteum and of the cortical layers of the bone. Within the innermost layer of the latter, where it borders the abscess, one can usually differentiate a definite granulation membrane in which scar tissue (fibrosis) predominates. A careful scrutiny of the roentgen-ray pictures shows that the abscess lies within the cancellous meshwork and not within the medullary cavity. That in late cases this may be simulated by the spreading of the process and by expansion of the abscess is confirmed by operating room observations. In a number of the cases there are scars of other previously existing foci of osteomyelitis present in other bones of the body and in other limbs. Much more commonly the abscess is an isolated phenomenon; in these the location of the focus is usually in the upper end of

the tibia, less commonly in the lower end of the femur, and least often elsewhere.

The question of the origin and development of such a clinical and pathological entity depends upon the interpretation of the available facts. In previous communications the anatomy of the vascular tree in the interior of a long bone was described and it was pointed out that one of the possible fixation points was located in the end vessels of the nutrient artery circulation. These end vessels are situated at the metaphyseal ends of the diaphysis close to the avascular area and the conjugal cartilage. Blocking of the circulation at such a point by a thrombus-embolus would quite necessarily result (1) in a lesion of minimum size, (2) in a focus whose spreading was limited by osseous tissue and (3) in a lesion in which bacterial growth and development would be hampered by mechanical conditions and by the accumulations of bacterial excrementitious matters unavoidable because of the lack of vascular and lymphatic avenues by which these can be removed. The latter leads to a marked reduction of the virulence of the bacteria contained within the abscess and many times to the final and complete sterilization of the abscess. Such an abscess, then, becomes a dormant one and increases in size not at all, or very slowly, and flares up only when there is a recrudescence of infection. These facts explain the insidious character of the process, the relative absence of symptoms, the long periods for which it is latent and the reasons for the sudden exacerbation of symptoms which many times brings this lesion to our attention.

Practically all of the cases are due to infection by the Staphylococcus aureus. The very few that are not are usually due to the typhoid bacillus. This again is a point in common with the ordinary forms of acute osteomyelitis.

The symptomatology of true chronic abscess of bone (Brodie) has a very limited scope. The one symptom that calls attention to the lesion is pain, characteristically intensified at night, persistent and gradually increasing in intensity. Examination then shows in only a part of the cases a

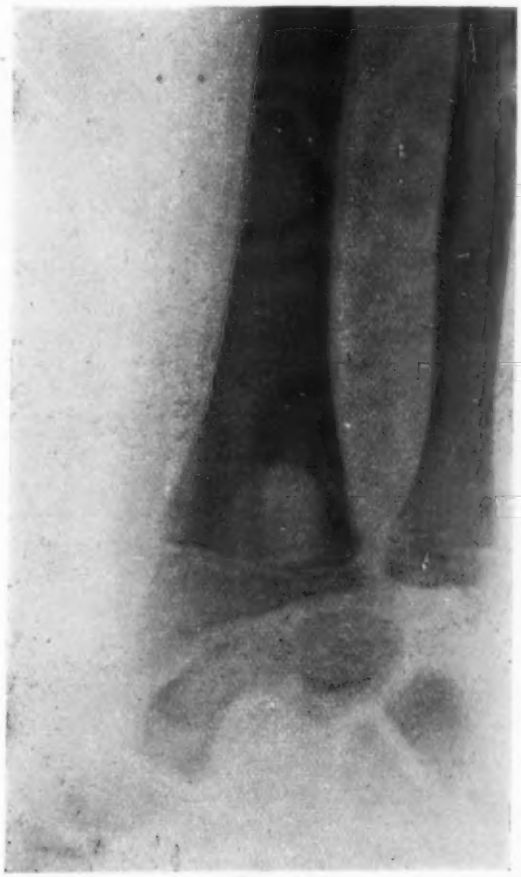

Fig. 2. An acute bone abscess in lower end of a radius. This form has an acute stage during which time, with rare exceptions, it must be treated surgically. A chronic abscess of the type shown in Figure 1 never follows this form of acute osteomyelitis. Compare with Figure 1.

thickening of the shaft of the bone; the latter is tender to pressure or sudden jarring. Except for a very slight grade of fever in some of these patients there are no general manifestations of any kind. These are practically all of the available symptoms for diagnosis. Blood cultures are always sterile. This is naturally understood from the extremely chronic nature of the lesion.

Corroboration of the suspected diagnosis is invariably made from the roentgenographic studies which show the sharply demarcated area in the extremity of the shaft of a long bone of different

roentgen-ray intensity from the rest of the surrounding bone. The diagnosis under these conditions is always therefore a positive one. In the present stage of our roentgenographic knowledge one can immediately exclude positively the other conditions which might simulate chronic abscess of bone (Brodie), such as bone cyst, tumor, etc.

FIG. 3. The end-result of a focus of acute osteomyelitis in a femur. An abscess was present. Both clinically and roentgenographically this is not a Brodie abscess.

Treatment is a very simple matter. In a certain number of the cases in which a sterile abscess exists, one may follow the suggestion of Brickner and evacuate the abscess through a drill hole; healing subsequently occurs. In others, and even in some of those in which the technique of Brickner is followed, this simple procedure is not sufficient. The abscess must then be laid wide open by an adequate osteotomy. The resulting cavity should be allowed to heal from the bottom up with or without the aid of sterilization by Dakin's solution according to the technique of Carrel. In such granulating wounds the local conditions may frequently be sufficiently favorable to permit secondary suture of the wound after sterilizing with Dakin's solution.

Chronic abscess of bone (Brodie) is notoriously free from complications either before or after operation. Before operation spontaneous perforation of the abscess very rarely occurs. In one case reported by Bancroft spontaneous rupture was followed by exacerbation of the infection. After operation healing invariably occurs following one of the methods outlined above.

SUMMARY

The impression is given distinctly and seems to be corroborated by clinical and pathological studies that Brodie's abscess is a chronic abscess of bone which has its origin in a thrombophlebitis developing around a thrombo-embolus arrested in a terminal vessel of the vascular network of the diaphysis of a long bone. This lesion is the end result of one of the manifestations of acute osteomyelitis and should be so classified.

CASE REPORTS

CASE I. Brodie's abscess in the lower end of the femur. Healing occurred promptly after osteotomy and drainage. Secondary suture was not done.

CASE II. Abscess in the lower end of the tibia which followed a trauma. Uneventful healing followed an open osteotomy.

Case III. This was a case of abscess in the lower end of the tibia which perforated spontaneously through the cortex and formed a subcutaneous abscess. Healing followed the properly performed osteotomy. There were other foci in this patient, one of which was in the os calcis of the same limb. The spontaneous perforation of the abscess is an unusual phenomenon.

Case IV. Several years previously a suppurative focus lying under the skin and overlying the upper end of the tibia was incised by another surgeon. The patient was assured that the focus did not involve the bone. Healing occurred after incision of the abscess. The leg, however, remained swollen and in the following year the swelling increased slightly in size. Latterly, pain appeared which was intensified at night and the patient ran a low grade of fever. Roentgenograms (Fig. 1) showed a typical Brodie abscess in the upper end of the tibia. Healing occurred after radical osteotomy; secondary suture of the wound was not attempted.

It is not possible to say positively whether the original subcutaneous abscess was due to a perforation of a bone abscess, which at that time was in a more or less acute stage, or whether there was an associated subperiosteal abscess. At the time of the second operation there was a definite Brodie abscess. The important point which this case brings out is the presence of the single pathological mechanism which caused the ordinary manifestations of an acute osteomyelitis and of the Brodie abscess.

Case V. Eleven years previously the patient was operated upon for an osteomyelitis of the left tibia. The exact characteristics of the lesion are not determinable. At the end of eight months the wound had entirely healed but some swelling remained. Five weeks ago there was a recrudescence of symptoms. Several days before admission the symptoms were aggravated markedly after the patient had twisted her ankle accidentally while walking. The roentgen-ray plate showed a typical chronic abscess of the upper end of the tibia with all the characteristics of the lesion described by Brodie. A radical osteotomy was done and the wound was allowed to heal from the bottom outwards. The pus contained a hemolytic streptococcus. This case has many similarities to the one previously reported.

I am indebted to Doctor Clarence Weil of the Mount Sinai Hospital house staff for aid in looking up the literature.

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THE COMPLETE DELEVOPMENT OF BILIARY TRACT LESIONS AND THE EFFECTS OF SURGICAL FORMS OF TREATMENT*

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BILIARY tract disease, excluding neoplastic and parasitic conditions, commonly gives evidence of its existence in (a) the subjective and objective symptoms of stone formation, (b) the subjective and objective symptoms of an infectious process, or (c) the subjective and objective symptoms of both of these factors combined. Previous studies have shown that the cases of cholelithiasis fall into a number of groups: (a) that in which the dominant etiological factor is a disturbance of the cholesterol metabolism; (b) that in which the dominant etiological factor is infection; (c) that in which infection and disturbed metabolism are intimately bound together.

DISTURBANCE OF METABOLISM

The actual cause or causes of the disturbance of the cholesterol metabolism leading to hypercholesterolemic conditions are not known. A combination of clinical and laboratory experience has established certain facts.

As a physiological phenomenon a hypercholesterolemia is present during pregnancy and persists for some time thereafter in the puerperium. It seems certain that under such circumstances a distinct biological purpose is intended, necessary apparently, only during the growth of the fetal tissues, and that the object is most probably accomplished through the agency of some hormone activity derived in the general environment of the pregnancy. This physiological phenomenon is so controlled as to enable the woman to compensate adequately for the abnormal increase in the production of cholesterol. One must assume from abundant clinical evidence that in the majority of cases the compensation is adequate and the excess of cholesterol in the body is removed by increased activity of the normal mechanism by excretion through the liver cells and by evacuation with the bile, so that no abnormality remains which could call forth any manifestations of disease. That the compensatory mechanism, however, is not always efficient is amply born out, also by clinical evidence, and cases of beginning cholelithiasis based on this mechanism are commonly seen in the period of the pregnancy and in the subsequent puerperium, as well as thereafter.

Hypercholesteremic conditions have also been observed in women in the absence of a physiological purpose (pregnancy) and have been observed in men in the absence of any gross extraneous factor such as a manifest infection. The available data give many reasons for believing that under such conditions the hypercholesterolemia is a fatigue phenomenon centered in the liver cell and brought about as a consequence of a comparatively sudden, or unduly prolonged if more slowly produced, marked increase in cellular activity which results from the attempts to remove from the circulation quickly or more slowly acquired extraordinary accumulations of lipoid bodies. Such overactivity of the liver cell is, under proper circumstances, followed automatically by a decrease of cellular activity extending all the way from various grades of dimunition to total cessation; this is the phenomenon of fatigue. A similar phenomenon and one much more widely known is the phenomenon of fatigue and rest in muscle tissue.

* Read before the Yorkville Medical Society, November 21, 1927.

Fatigue in the liver cell is thus accompained and followed by the retention in the blood stream of extraordinary accumulations of cholesterol. Opportunity for recuperation is provided by lessening the work of the liver cell, i.e., by lessening the supply of lipoid delivered in the diet until the overload is gradually eliminated, or by favoring the rapid elimination of bile components by medical means or by surgical drainage. The resting stage follows and corresponds to a balance between the normal supply of lipoid delivered to the liver cell and the normal elimination of bile from the biliary system.

Many of these subjects are of the adipose type and in them there exists constantly abnormally large amounts of lipoid material, much beyond the body's normal requirements. Sometimes this is associated with the habit of taking an overabundance of food but in any case the retention of lipoid in the body is associated with a derangement of the ductless gland activities and with an inability to handle and burn up fat. In persons of this type and with this "diathesis," the condition is undoubtedly a congenital anomaly; in them the threshold to fatigue in the liver cell is ordinarily abnormally low. Then disturbances come quickly and upon comparatively trival provocations; constant care is necessary to keep the normal balance.

In other persons of this general type the decreased tolerance and the quickly acquired state of fatigue in the hepatic cell is a pathological development. Previously published studies by Oertel, Stadelmann and Eppinger, Jr., show that some activity liberated in the liver cell environment causes specific changes in the cell protoplasm leading (a) to an interference with the proper synthesis of bile components, or (b) at least to a lack of proper discharge of the finished product (bile) into the biliary passages, and (c) to a resultant retention of bile components in the blood stream. Fatigue under such conditions is an artificially produced phenomenon.

This pathological activity is, undoubtedly, of a chemical nature and the actual agent is probably some toxic body. The place from which these toxins are most likely to originate is in the intestinal tract. Such poisonous bodies may, first of all, be derived from the activity of the intestinal bacterial flora. Or the toxins may result from the normal digestive processes in which an excess of normally produced but, nevertheless, harmful by-products are split off and sent to the liver via the portal system to be neutralized and excreted or otherwise dealt with. Under appropriate circumstances it seems likely that both of these factors, the congenital deficiency and activities in the intestinal tract, may aid and abet one another, and a vicious circle may thus be formed. There are many reasons for this supposition in clinical practise.

The actual mechanism of stone formation within the confines of the gall-bladder has been exhaustively discussed on previous occasions (Wilensky and Rothschild) and the discussion will not be repeated here. Suffice it to say that with hypercholesterolemic conditions, the actual precipitations of stone is associated with bile supersaturated in the manner previously indicated with cholesterol and resulting from the removal of excessive amounts of lipoid from the blood stream; that the active stage of stone formation is a temporary phenomenon associated with or subsequent to definite physiological or pathological states, and that the latter are commonly interrupted by definite quiescent periods of longer or shorter duration.

Disturbances of physiology are sometimes symptomless; more commonly the symptoms are of a meagre and ill defined nature, or are obscured in the manifestations associated with the physiological state (pregnancy) with which the changes in the cholesterol metabolism are associated. Only occasionally can definite symptoms be distinguished.

Clinically the periods of remission are symptomless. This corresponds to the post-

mortem room experience that 60 per cent of all female cadavers coming to autopsy have gall-stones. This corresponds fairly accurately also to the proportion of cases in which a disturbance of metabolism is the dominant factor at fault, either in a single period of activity or in a very few periods of activity. Symptoms during the remission periods in true metabolic cases can only be due to the mechanical effects of stones acting as foreign bodies (gall-stone).

INFECTION

Infection in the biliary tract appears in more than one guise, usually as a pathological process associated or unassociated with the precipitation of stones. Most commonly the unassociated form appears in the male subject as acute, subacute and chronic forms of gall-bladder infection (empyema).

When the territory involved in the infectious process is limited to the gall-bladder, the cases are most apt to come to operation either during or immediately after the primary infection or after very few attacks of acute cholecystitis (empyema). In the latter case, the periods of remission are comparatively short in length. Probably the repetitions of attacks of cholecystitis under these circumstances are no independent clinical phenomena but represent a continuous process punctuated by exacerbations of infection.

Infection in the biliary ducts appears as acute and chronic conditions. As an acute phenomenon (acute cholangitis) infection does not form an etiological factor in the precipitation of stones. As a chronic phenomenon, infection in the bile ducts, especially in the capillary vessels between the liver cords, becomes associated with the deposition of fibrous (scar) tissue. This usually takes the form in which the scar tissue is deposited between the liver cords and approaches most nearly in its morphology the pathology associated with hypertrophic cirrhosis of the liver.

Stone formation associated with infection limited to the gall-bladder is commonly based on the remains of previously existing states of infection (mucobacterial nidus around which lime salts are deposited), the active stage of which had preceded the precipitation of stones by an appreciable time interval. With infection by Bacillus typhosus, the original typhoid fever is fairly commonly still present when the first attack of cholecystitis occurs. In the first instance the symptomatology is vague and obscure; in the second, the symptomatology is sharply demarcated.

Infection in the biliary ducts as a chronic affair is apt to be a more or less continuous process. Very occasionally the cholangitis is associated with stone formation (intrahepatic biliary duct calculi.) The proportion of cases of intrahepatic biliary duct stones, as opposed to gall-bladder calculi, is a very small one and I believe the figures correspond accurately to the number of cases of true chronic cholecystitis, with and without stones.

JAUNDICE

Jaundice appears as an important and common symptom and factor in all biliary tract conditions. Staining of the tissues with bile is otherwise a phenomenon which accompanies the abnormally increased dissolution of red blood cells and in ordinary practice the condition is found to accompany and follow the absorption of large extravasations of blood, or the abnormally large destruction of red blood cells which accompanies the various forms of primary and secondary hemolytic disease. In essential biliary tract disease (stones, infection, etc.) jaundice appears to find its origin in the natural and normal wastage of the red blood cells, and discoloration of the tissues, skin and conjunctivae is caused to appear by gross obstruction in the major bile ducts or in the bile capillaries to the elimination of the normal secretion of bile, and by certain functional changes in the intracellular activities of the liver cells which prevent the synthesis of bile components

and the passage of the finished product through the liver cell filter out into the biliary tract. Essentially the mechanism, in contradistinction to the increased production accompanying hemolytic disease, is one of decreased elimination in the biliary tract due to functional change or organic (mechanical) obstruction.

Jaundice due to organic (mechanical) obstruction seems to interfere with the functional activity of the liver cell. An exact parallel seems to be present in this respect between the hepatic and renal conditions, in each of which calculi are present which cause diminution of function (liver or kidney) as a secondary effect.

The mechanism of this secondary effect of obstructive jaundice upon the functional activity of the liver cell seems to be intimately associated with pressure conditions in the biliary tract. The efficacy of the liver cell both as an active agent in the synthesis of bile components and as a filter seems to be directly dependent upon the freedom of passage of the bile through the biliary ducts and upon its prompt evacuation into the intestinal tract. The spread between the normal "high" and "low" pressure in the common duct is normally regulated by the elasticity of the walls of the gall-bladder, and is closely connected with the periods of increased activity brought about by and occurring during the periods of digestion. The normal "mean" pressure is a resultant of all these factors, and its unimpeded continuance is conducive to the greatest freedom of activity of the liver cells when other factors, such as those referred to previously (physiological hypercholesterlemia, liver cell fatigue in diathesis, infection) are equal.

During obstructive jaundice the "mean" pressure rises in the duct system. Interference with the activity of the liver cell occurs promptly and in direct proportion to the increase in pressure. This can be demonstrated very well by following the variations in the Vandenbergh test as shown quantitatively in the daily examinations of the bilirubin content of the blood. Changes are demonstrable even when the discoloration of the conjunctivae is so slight as to be barely or sometimes not at all distinguishable. In far advanced conditions of jaundice—far advanced both in point of time and in depth of intensity—secondary changes in the liver cell are seen to assume large proportions as will be subsequently shown. In relatively acute conditions the degree of disturbance seems to be of somewhat more importance than the length of time the disturbance has been present. In chronic conditions extending over long periods of time, the opposite seems to be true.

In operating upon acute gall-bladder conditions, I have frequently noticed that slight or moderate grades of jaundice are visible in the skin and conjunctivae when during operation no gross obstruction exists in the larger ducts available to view in the operative field. I am sure this is a common experience with other men also. In a few instances in which post mortem examinations were later available, the operating room observations were corroborated and sections of the liver showed, microscopically, either no change at all or changes which were practically negligible (slight increase in round cells in Glisson's capsule, etc.). I speak of this because it seems difficult to explain such jaundice except on the basis of interference with liver cell activity. I do not believe that inflammatory swelling of the ducts plays any large role in the mechanism of this variety of jaundice. Certainly at operation this factor seems to be of negligible account.

The retention in the blood of bile components, which result from an interference to their proper removal from the circulating blood in the liver, brings about their attempted compulsory evacuation through the kidney. This is always only partially successful because the compensatory mechanism is not sufficiently powerful. The insufficiency of result seems to be due in large part to the damage which

the passage through the kidney filter of bile components, notably the bile acids, does to the renal epithelium. Much pathological evidence has been accumulated to prove that the bile components (pigments, salts, etc.), which, retained in the blood, not only attempt to find their way out by the urinary path and thus mechanically plug the uriniferous tubules, interfering with their efficiency, but actually injure the epithelium of these excretory channels (Moelius, Charin, Lichtwitz, Werner). According to Kehr such kidney damage is further augmented in operative cases by the toxic effects of any anesthetic. Columnol and Ascoli have shown that the damage produced by the bile components lessens the natural resistance to the toxic effects of the anesthetic drug.

Kidney damage of this kind is a regular accompaniment of moderate and advanced grades of jaundice and can be demonstrated easily in clinical practice. When the jaundice is a temporary phenomenon, the renal cell damage disappears with the discontinuance of the passage of bile components through the kidney filter and their renewed passage through their natural channels of evacuation, the liver. Restitution to the normal apparently occurs after the temporary disturbance so that no evidence of renal cell damage can be demonstrated in clinical practice by examination of the urine. This has been corroborated by post mortem examination of the kidneys. In advanced cases of jaundice or in those in which lesser grades of jaundice are continued for comparatively long periods of time, the restitution may not occur, and in appropriate instances it seems correct to assume that any fatal issue which may follow is due to the renal damage.

In a certain proportion of the cases in which secondary changes (degeneration) occur in the kidney, evidence of the latter damage is frequently available in the retention of extraordinary amounts of nitrogen bodies in the blood. The clinical relationship of the retention of nitrogen bodies in the blood to the surgical problems in biliary tract disease (infection calculi, etc.), have been exhaustively discussed on previous occasions and a repetition of the discussion will not be made here (Wilensky and Colp). Suffice it to say that in a certain number of the cases a pronounced state of renal insufficiency is present as demonstrated by the diminution of the gross urinary output, by the reduction in phthalein excretion, and by the retention of nitrogen bodies in the blood.

In summing up all of these facts it appears that the biological sequence of events of the entity which has its inception in biliary tract disease includes (a) an initial lesion in the biliary tract—disturbance of cholesterol metabolism, calculi, infection, etc., (b) a consequent primary effect upon the hepatic cells leading to disturbances in liver physiology and (c) a secondary effect in the renal apparatus which leads to an acute injury of the renal epithelium.

Terminal manifestations occur in the second and third stages and especially after operative intervention. The deaths after operation cannot always be explained by the surgical trauma inflicted nor by the development of sepsis. All of the fatal cases may be divided into two main classes, the chief differentiation between the two being an outspoken kidney insufficiency.

It is quite evident that dysfunctions of the liver and the kidney are responsible for the clinical picture. From clinical and laboratory observations the assumption seems inescapable that the cases in the first class owe their manifestations to an advance of the biological entity under discussion to the second stage previously referred to, that is, to the stage of liver dysfunction. Similarly the conclusion seems inescapable that cases in the second class owe their additional clinical and laboratory phenomena to a further advance of the disease to the third stage to which reference was previously made, namely, to the stage of kidney damage.

Peculiar forms of terminal toxemia occur in both the second stage of the disease, the stage of liver dysfunction, and in the third stage, the stage of renal damage. That occurring in the stage of liver dysfunction and insufficiency presents a distressing symptom complex and is quite varied in its manifestations. This condition has been termed "cholemia." The toxemia occurring in the stage of renal degeneration is associated with the evidences of renal insufficiency and seems similar to those manifestations of generally similar nature which we are accustomed to see in ordinary cases of acute and chronic nephritis and which are customarily classified under the generic term "uremia."

In either case the terminology in the light of present day knowledge seems unfitted and obscure. Literally, cholemia means "bile in the blood," a condition present, however, in all cases of jaundice, even when toxemia is absent. Walters and William Mayo have suggested terms such as "cholemic hepatitis" or "cholemic nephritis," to indicate the existing pathological condition. While the term "cholemia" might be appropriately used for the conditions described in the second stage, it seems even better to drop the use of this term altogether and to employ the phrase "hepatic toxemia" to describe what actually happens. Similarly the phrase "renal toxemia of hepatic origin" might better describe the conditions in the third stage.

Our studies have inclined us to think that these disturbances of hepatic or hepatic-renal physiology carry along the idea of a "fatigue phenomenon." It seems highly probable that much abnormality can and does often occur which shows no perceptible evidence at the bedside or in the laboratory because of the enormous compensatory powers of the liver. However, when the limit of durability is overreached, the entire mechanism breaks down; then, and only then, are definite evidences presented to the clinician. This explains the prompt recuperation after marked physiological disturbances, such as follows the free drainage of bile in obstructive jaundice, or which follows the injection of glucose when the intravital mobilization of sugar is interfered with; this explains the prompt disappearance of the signs of renal damage coincidently with improvement of the primary hepatic condition.

The practical lesson to learn from these facts is that biliary tract disease (infection, calculus formation, or both) represents the beginnings of an entity the uninterrupted progressive development of which is capable of spreading to other organs in the body and ultimately to issue fatally. Only too frequently, because of the comparatively enormous compensatory powers of both liver and kidney, early symptoms appear to present little of dominating importance and the pathology and pathological physiology are relatively far advanced and secondary effects have had time to establish themselves more or less permanently before the patient presents himself or herself for adequate treatment. Undoubtedly this is due to lack of the newer knowledge concerning these very important facts on the part of the general practitioner, and upon the insistence of the patient, as well as of a certain class of practitioner, upon "medical cures."

The lesson must be thoroughly learned that energetic treatment is necessary as soon after the inception of this pathological process as is humanely possible. For this purpose surgical forms of therapy are undoubtedly best. The following objects must be accomplished: (a) the thorough removal of any focus of infection; (b) the thorough removal of any obstruction to the normal excretion of bile, and (c) the adequate preparation for the reestablishment of the normal balance between food intake and bile output which accompanies the normal proportion of cholesterol in the body.

The effect of the various types of operation upon the biliary passages can be summarized as follows:

The operation of cholecystectomy accomplishes two objects.

It removes the local focus of infection, when that is present, and removes the reservoir of bile with its contained stones and stagnant bile, thereby removing some of the end results of the pathological disturbance in the cholesterol metabolism which had already taken place. The agent which has complicated this biological disturbance or which has initiated the stone formation is removed. There is no effect upon the cholesterol metabolism unless bile drainage is provided by leaving the stump of the cystic duct open or by combining with this operation a choledochostomy.

The operation of cholecystostomy affords a surgical method for draining the infected area and affords a competent method of biliary drainage.

When the focus of infection is strictly limited to the interior of the gall-bladder, there is fair assurance that both cholecystectomy and cholecystostomy will give control of the infection. Under such circumstances cholecystectomy is preferable to cholecystostomy because the latter is apt to be followed by certain structural changes in the gall-bladder wall, especially at its outlet in the neighborhood of the cystic duct, which would cause interference with the normal evacuation of the gall-bladder. Symptoms then follow which commonly lead to a secondary operation, during which cholecystectomy must be done. Under these circumstances the best rule to follow is always to do cholecystectomy except when definite contraindications, especially in the general condition of the patient, are present.

When the focus of infection has spread outside of the gall-bladder wall into the surrounding tissues, cholecystectomy is the sole operation to be considered. In poor surgical risks the extra hazard of a cholecystectomy can be avoided by doing an atypical operation. The exposed wall of the gall-bladder is incised in a vertical direction from fundus to cystic duct; as much of the fundus and lateral walls of the gall-bladder are resected as comes easily within reach, and the remainder of the interior and the exterior of the gall-bladder is completely drained by tube and gauze packing.

When the focus of infection has spread outside of the interior of the gall-bladder along the biliary tract (cholangitis) cholecystostomy is preferable to cholecystectomy for the reason that it facilitates drainage of the biliary tract. Cholecystectomy must be combined with drainage of the stump of the cystic duct or better still with a separate choledochostomy if drainage of the biliary tract is desired. Cholecystostomy under these conditions must sometimes be done as a temporary measure with the knowledge that cholecystectomy must subsequently be done. A middle course which combines both of the benefits of a cholecystostomy and the permanence of a cholecystectomy can be reached by doing the atypical operation referred to in the previous paragraph in which the vertical incision which is made in the anterior wall of the gall-bladder is enlarged through the cystic duct into the common duct. A rubber tube of large calibre which provides free drainage can then be introduced into the duct.

The effects upon the cholesterol metabolism of the chief operative means of bile drainage into the gall-bladder at the stump of the cystic duct and into the common and hepatic ducts may be summarized as follows: (a) With common and hepatic duct drainage the system is rapidly depleted of its cholesterol bodies. (b) Gall-bladder drainage, including drainage into the cystic duct, does not accomplish this extreme effect unless there be a concomitant obstruction in the common bile duct. (c) The rate of drop of the cholesterol in the blood serum varies and depends upon the initial figure and the length of time of drainage; after a certain minimum is reached, there is no further fall in the cholesterol content of the blood. (d) These effects are obtainable only when the

operation has been so performed that proper bile drainage is accomplished and all obstructions have been removed from the ducts. (e) When obstruction is present before operation the complete removal of this obstruction is followed by a fall from the preoperative hypercholesterolemia, the figures reaching a normal level very promptly. (f) If the preoperative figure has been low because of an associated high temperature, the drop of temperature following operation is accompanied by a rise in the cholesterol content of the blood to the normal level. (8) When the postoperative drop has been large and there had been no antecedent obstruction the fall is partly due to a lipoid-free diet.

The effect of bile drainage *per se* upon the underlying metabolic activities is the removal of that portion of the cholesterol which exceeds the normal minimum content. How thoroughly this is accomplished depends upon the severity of the metabolic disturbance and especially upon the completeness or incompleteness of the biliary fistula. When this is complete, one may see the cholesterol content of the blood fall to values below the usual normal.

Efficient bile drainage is followed by another most important effect, namely, that upon the liver cell. The liberation of the liver cell from any undue pressure consequent upon any backing up in the bile passages, the lessening of the work which follows concomitantly with the establishment of an external biliary fistula, the control of any infection which has spread up into the biliary ducts—all these tend to bring about a restoration of the liver cell to a state of normal activity, that is, to a relief of any state of fatigue. The progressive establishment of normal, full activity in the liver cell rapidly controls any impending onset or brings about a prompt retrogression in any established state of hepatic toxemia (cholemia). For this purpose transfusion of blood and the mobilization of large amounts of glucose in the free vascular circulation are of enormous aid. Furthermore, the rectification of any primary disturbance in the liver environment reacts most favorably upon any secondary effects which may have become manifest, notably, those upon the renal epithelium, and prompt retrogression of any lesion or disturbance of physiology which may have occurred in these distant organs follows spontaneously. Such retrogression, however, occurs only when the deviation from the normal has not progressed to such an advanced state as to make impossible any recuperation, possibly because the advance of the disease has progressively destroyed more and more of the compensatory mechanisms so that not enough of the latter remain to tide the subject over the critical period when the normal mechanism is being restored.

It is evident from these facts that the proper operation, efficiently carried out, combined with the intelligent use of bile drainage, restores the cholesterol content of the blood and bile to the normal. It is evident, too, that the essential cause of the hypercholesterolemia has probably not been influenced in any way. Incidental to this treatment, the state of fatigue in the liver cell with which these disturbances are associated disappears and a state of full normal activity returns to the liver cell. What is accomplished is the restoration of the individual to that previously existing period of life when no disturbance of the cholesterol metabolism had yet taken place. This does not mean that the causes of this disturbance have been removed and a recurrence of any physiological (pregnancy) or pathological (diathesis, infection) cause may be followed by a recurrence of the metabolic disturbance. Preventive measures for this should be employed as far as lies in our power.

RELATIVE VALUE OF THE WERTHEIM AND SCHAUTA OPERATIONS IN CANCER OF THE CERVIX*

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THE history of uterine carcinoma surgery encompasses only a few decades, although it is true that attempts had been made to remove uterine cancers as long ago as the end of the eighteenth century. The measures employed at that time consisted of curettage of the cervix, cauterization, and amputation of the cervix. While these therapeutic efforts were of no definite scientific value, it is worthy of note that even these primitive methods effected occasional temporary cures, and certain authors reported cases of ten or fifteen years' standing without recurrences.

The real history of uterine cancer surgery began when the three chief dangers of extirpation were recognized: hemorrhage, injury to adjacent organs, and the danger of implantation of malignant cells. The profession learned how to avoid, or rather prevent, them. This era dawned about the end of the nineteenth century.

Pelvic surgeons then began extirpating the uterus involved in a malignant process by two different routes; vaginal and abdominal. With the development of surgical asepsis and the progressive improvement in operative technique, both methods have become popular in the hands of different operators. Vaginal removal of the cancerous uterus was favored for a long time, particularly during the years when surgeons had a justifiable fear of opening the abdominal cavity. Thus the vaginal operation held sway for a certain period because of its comparatively low primary mortality. With the passing of time, however, it gradually lost its favored position, because the fact was recognized that simple extirpation of the cancerous uterus is unlikely to insure a cure. Appreciation of the significance of the coincident involvement of the lymphatics brought laparotomy to the fore, and the latter method reached its greatest vogue when Wertheim perfected the technique of radical abdominal hysterectomy.

Wertheim ligates the uterine arteries, isolates the ureters, clamps the broad ligaments and excises them completely, freeing the cervix from the vagina, bladder and rectum. With specially designed forceps the upper third of the vagina is clamped and the amputation made at this level. In the opened infundibulopelvic ligaments, the lymphatics and lymph nodes are removed. The leading gynecologists of the world adopted this method with enthusiasm, and no pelvic surgeon was considered modern at that time who did not follow Wertheim's technique. Before long a mass of statistics was at hand, which was utilized for a careful evaluation of the merits of this operation. It soon became apparent that radical abdominal hysterectomy is attended by a high primary mortality, and even today it stands at about 15 per cent. In addition to the discouraging mortality in those patients who survive the operation, there is a relatively high incidence of intraperitoneal and extraperitoneal infection: parametrial and pararectal suppuration, cystitis, fistulae, embolism, etc. Such results again directed the attention of a number of gynecologists toward vaginal extirpation.

Efforts to evolve a radical vaginal procedure finally resulted in certain modifications which culminated in the method described by Schauta. By this technique the parametrial tissue becomes more acces-

*Submitted for publication, June 2, 1928.

sible through a deep perineal incision. A circular incision is made and a cuff formed. The open end of the cuff is closed tightly with sutures to prevent the escape of possibly infectious material. The ureters are separated from below, the uterine arteries ligated high up and the parametria excised. Thus the limits of extirpation are expanded. Compared with Wertheim's operation, its sole disadvantage lies in the fact that the lymph glands located high up are not removed.

The immediate results of the Schauta operation are infinitely better than those of the Wertheim. Analysis of a large mass of clinical material shows a primary mortality of about 4 per cent, which is approximately one third of that of the extensive abdominal operation. Adjacent organs are subjected to much less damage and the procedure is not nearly so severe an ordeal for the patient.

Despite the more satisfactory results, Schauta's method did not supplant Wertheim's. The majority of the leading Continental gynecologists enthusiastically continued to employ the radical abdominal hysterectomy, justifying their persistence by the argument that those patients who survive the Wertheim operation have a better chance of cure, while those who succumb are freed from their suffering at an earlier period.

A due appreciation of the effects of roentgen ray and radium upon malignant tumors brought about a revolutionary change in the therapy of cancer. Encouraging early results induced many operators to abandon surgery entirely and substitute irradiation. Many years elapsed before a wider experience demonstrated that irradiation was not fulfilling all of its early promises. The exceptionally good results of irradiation in some cases were counterbalanced by disappointment in others. This discrepancy is explained by the fact that all malignant tumors, even those of the same clinical and histologic type, are by no means equally radio-sensitive, many being highly resistant. While irradiation has not solved the problem of cancer therapy, it is undeniable that it is the method of choice in many cases of cancer of the uterus.

The association of this powerful ally with operative methods marks the period in which the vaginal route should have taken precedence over laparotomy. Since the effective action of irradiation can be depended upon to a certain extent, it is not necessary to insist upon a complete dissection of all the lymph glands. The importance of the latter step is actually not sufficient to justify subjecting the patient to the greater hazards involved in its performance. The real value of seeking and removing all the pelvic lymph glands in the abdominal operation seems problematical in the light of recent investigations. The experiences of other operators who practiced extensive lymphatic dissection, together with his own observations, influenced Wertheim in one of his later publications to warn against overenthusiastic parametrial exposure. The radical abdominal technique is so dangerous that a large number of patients die during or soon after the operation. The long and bloody procedure weakens the patient so much that she cannot cope with the subsequent complications. The urinary organs are especially susceptible to postoperative injury and disease. As the profession came to appreciate these facts, the exploring finger, seeking and palpating pelvic lymph nodes, became more timid and the operators gradually restricted their parametrial invasion. Thus there was a marked improvement in Wertheim's later statistics.

It must be conceded that the development of the wide and radical hysterectomy stands out as one of the great accomplishments of modern surgery, as it contributed much to the recognition of the various forms of uterine cancer, pelvic metastases, the rôle of the lymph channels in the spread of the disease and the pathologic anatomy of malignant disease in general. However, the Wertheim operation does not carry into practice the theory of

complete extirpation. Assuming the above premises to be correct, the superiority of the abdominal operation with its higher morbidity and mortality, as compared with the less dangerous and more simple vaginal operation, is questionable.

There still remains one moot question: What is to be done with the affected lymph nodes? This is the basis for supplementing the vaginal operation with irradiation therapy. When soon after the introduction of irradiation as a therapeutic agent it failed to fulfill all the hopes that were placed in it (the cure of cancer), it was unjustly relegated to the background by many Continental operators and in some institutions was utilized only in hopeless cases. Additional experiments and further experience reawakened the early optimism and now it has found its proper place and established itself in the treatment of cancer.

Irrespective of differences of opinion between Continental and American operators as to the choice of irradiation or operation as a method of cure, the former may be relied upon for the control of the lymphatic structures that cannot be reached during the course of a vaginal operation. It is important to remember that roentgen-ray and radium therapy are still in the process of development, whereas the operative technique has practically reached the limit of perfection.

My personal experience in the operative treatment of carcinoma of the cervix by the vaginal route includes 220 cases. The majority came within the period of my connection with the Gynecological Department of the Hungarian University of Sciences at Budapest. The Director of this institution, Professor Toth, with whom I was associated for six years, is a strong protagonist of the vaginal operation. The primary mortality of the 220 patients operated upon by the vaginal route was 3.6 per cent, which is about one-fourth the percentage of Wertheim's deaths. After these operations the following complications were noted: (1) a vesical fistula in four cases, three of which closed after suturing, while the fourth left the hospital with a small fistula; (2) a rectal fistula in two cases, both of which healed after a secondary operation, and (3) postoperative hemorrhage in three cases, in two of which the bleeding points were controlled with hemostats through a speculum; these two patients left the hospital apparently well, but the third died of peritonitis on the third day, after the hemorrhage had been arrested. Severe urinary symptoms, so frequently observed after a Wertheim operation, did not occur in any case.

In general we followed the radical vaginal operation described by Schauta and deviated from his technique only in not making the perineal incision in every case. It proved unnecessary in many instances and by its omission we reduced the dangers incidental to a prolonged operation, possible wound infection, etc.

Unfortunately, it is impossible to present an accurate follow-up of our patients. The War scattered a large number and it was impossible to reestablish a contact with them, but in a recent personal communication Professor Toth states that he has succeeded in locating 55 patients after more than five years. Of these, 20 are living and well, a five-year cure in 36 per cent.

In the light of our experiences we believe that the future therapy of uterine cancer will embrace a combination of the vaginal operation and irradiation. It is worthy of mention that the school of which I was a member for about ten years, at the time when the Wertheim operation was most popular, outlined its principles along these lines. Other gynecologists have recently directed their thoughts in the same direction: Pestalozza in Italy, Stoeckel in Germany, and others. Surgeons are naturally slow to discontinue using an interesting and exact technique which required years of study and practice to perfect, and substitute a more simple and less spectacular one.

To insure good results from the vaginal operation we must exercise two functions: good surgical judgment and correct technique. The method itself is an aid in the proper selection of cases. The further advanced the malignancy, the greater the parametrial infiltration and consequently there is a corresponding limitation of uterine mobility. Absolute fixity of the uterus makes the operation impossible at a time when overenthusiastic surgeons might be tempted to do an abdominal hysterectomy. This automatically protects the patient from too much surgery. The vaginal operation particularly requires an exact knowledge of pelvic anatomy and the technique cannot always be carried out in a routine manner. Before operating, unforeseen and unexpected complications (adnexitis, adhesions, myomas, etc.), which may make the operation atypical, must be anticipated. Easy operations will alternate with those that are difficult, and a great deal of practice is necessary to acquire a satisfactory technique.

Finally, the assertion may be ventured that so long as the etiology of cancer remains an enigma, its prophylaxis and therapy will be a problem. We can only indicate the route by which we can hope to achieve the best results. The vaginal operation, supplemented with full dosage irradiation, offers much as compared with the radical abdominal hysterectomy, chiefly because of the lower morbidity and mortality and the better prognosis.

TREATMENT OF HIP-JOINT DISEASE AT THE NEW YORK STATE ORTHOPEDIC HOSPITAL FOR CHILDREN*

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AT the outset it should be noted that children only are received as patients at this hospital. The treatment of hip-joint disease in adults should be vastly different for economical, psychological and pathological reasons.

Opportunity has occurred during the twenty-eight years since the opening of this hospital for the careful deliberate study of the effect of the various forms of treatment recommended in these cases. The necessity of discharging patients as soon as sufficient improvement has been obtained to make them ambulatory cases has not existed and as a rule a patient has not been discharged until he has been kept under observation for several months after all apparatus has been discarded.

In these cases the desideratum for success is the recognition of an abnormal general condition as well as the local pathology. Neither can be slighted by the concentration of the surgeon's attention to only one of these factors. Both, upon admission, will be found to depend upon the general well-being of the child before the onset of the disease and the extent to which the disease has been allowed to progress.

In the building-up of the constitution, nourishing food and good fresh air, in fact, all the factors generally inclusively called hygienic considerations, have been taken, but we have attempted to study more in detail the value of each factor. For several years these cases were moved out of doors from the wards and placed in the sunshine from about 9 o'clock in the morning until 4 in the afternoon. It was decided that this was an advance but we regretted the delay often encountered in carrying it out as the general ward work often cut short this out-of-door treatment by several hours. While the wards were well ventilated, we felt the time out of doors should be increased. This led us in 1908 to try the innovation of leaving the patients out day and night. A wooden platform was built with a roof. The sides were swung on hinges so that they could be raised to expose the patients to the air from all points of the compass or closed on one or more sides during heavy storms. There were no arrangements for artificially heating the place. Day and night, winter and summer, these patients were kept in this shack. Since that experiment we have aimed in all our building operations to have ample porch facilities for the accommodation of these cases.

We have used exposure to the sun as a therapeutic measure during this period, beginning with short exposures of a part of the body and increasing the amount until the entire nude body could be exposed for several hours. Since the advent of the mercury lamp, we have been using that to add to our exposures to ultraviolet rays. However, the beneficial effects of heliotherapy on the physiological processes do not seem to us to be confined to their direct application to the skin. The sun rays, the entire atmosphere and even on cloudy days the air has been rayed outside of the storm region and is brought into the sunless areas by air currents. Just as foods rayed by a quartz light when fed to an animal are found to transmit some of the rays' benefits, so exposure to rayed air may also be beneficial. Whatever the reason, we feel that the twenty-four-hour exposure to the open air is of inestimable value. From an experience of several years in a seaside hospital, we also believe that country air is more valuable than sea air. If we are right, it must be that vegetation adds something to the atmosphere which is missing at the seashore. It can hardly be a question of altitude, as the State Hospital is situated only 300 feet above sea level. Therefore we conclude that the effect of the direct rays of the sun and of ultraviolet rays from a quartz lamp have a profound effect on metabol-

* Read before the Section of Orthopedic Surgery, New York Academy of Medicine, May 18, 1928.

ism, but that these beneficial effects are also obtained by exposure to out-of-door air, especially in the country.

The skin and lungs must be kept as active as possible, through cleanliness of the former and the deep breathing induced by singing and laughter for the latter. The diet should be mixed unless some pathological conditions point to a narrower regulation. As a rule carbohydrates should preponderate.

But of more value than the exact diet, and the best conducer of refreshing sleep and stimulant to glandular functioning, is happiness. In no age is the bodily function so dependent on the mental condition as in childhood. All adults know the effect of worry or any unhappiness on the digestion and on sleep. This is augmented many fold in children. So susceptible are children to the personal environment that surrounds them that a flower in the dark, unwatered, will not fade quicker than will a child's physiological reactions show the effect of being surrounded by indifference, gloom and bickering. This atmosphere of love and affection has been cultivated in our hospital to such an extent that many rules and regulations usually considered necessary in the management of a hospital have been ignored. No matter how well trained a nurse may be she is inefficient for our service if she lacks that personal understanding of children which arises from the heart rather than the brain. Not an employee in whatever capacity but has felt that the object of the hospital even to its minutest details was solely for the welfare of the patients and that his or her job was of essential value in obtaining good results.

Occupation of the mind is also found to be a wholesome stimulant to body functions. With that object, teachers are employed in kindergarten work as well as in the regular grades for older children. This work is conducted at the bedside when necessary. Music lessons, instrumental and vocal, are also given.

Stimulation of the natural body resistance to tuberculous infection has been attempted by the use of tuberculin and has been discarded. A report of this study was made to the American Orthopedic Association and printed in its transactions of 1909.

Aside from the local condition, the question of confinement in bed or being allowed up for part or all of the day has been determined by the temperature and weight charts.

The treatment of the local condition has been determined by the clinical signs in each particular case. It is a sad commentary on the ability of surgeons that diagnosis, prognosis and treatment are so often made dependent on laboratory findings, and that examination of the patient and of the joint are used only as secondary factors. The constitution of the patient is not infrequently ignored altogether. The actual existence of the disease and its present stage of activity are often stated from an examination of radiographs. The diagnosis is sometimes withheld until a specimen of the offending organism has been actually recovered from the infected tissues. The laboratory is of inestimable service but in the art of surgery it can be of scientific value only. It never can rise above the position of handmaiden. The art of the physician never can be subservient to the science of medicine. Experience in the art of practice is more to be desired than skill in handling technical apparatus, but this skill is a sine qua non in the armamentarium of the successful doctor.

The diagnosis of hip-joint disease soon after its advent from clinical evidence alone may lead to errors but the writer ventures to assert that such errors are of less importance than treating with half-way measures until bony changes are shown in roentgenograms, or material taken from the joint shows the presence of the bacillus. There are those who seem to think that once the diagnosis is made of hip-joint disease the treatment must be prolonged regardless of changes in signs and symptoms.

The axiom of traction within the range of motion set by nature has been adhered to steadfastly in our practice. The means of obtaining this traction varies with the necessities of the case. In early cases where the deformity is due solely to limitation in extension, a rest board raising the leg to an angle with the bed greater than that of the flexion deformity, and with weights applied in the line of the leg, is all that is necessary. In cases where other deformities exist, more complicated apparatus is used. The traction is obtained by the application of moleskin plaster, applied in small strips arising from two broad pieces at the ankle where buckles are attached. These strips are applied in a spiral up the leg and thigh, forming a criss-cross pattern, one-third of the pull being below the knee and two-thirds on the thigh. Modification of this method of traction has to be made in the presence of sinuses, abscesses and skin diseases. In all early

cases the deformities are due to muscular spasm and disappear in proportion to the lessening activity of the disease. When the greatest angle of extension is 140° or 150°, a Taylor hip brace is applied. As the joint sensitiveness decreases and spasm is present only upon reaching the extremes of motion, the patient is allowed up with a traction brace and with crutches. Daily examination for any joint indication that all is not well makes it possible to change the treatment if necessary before any damage is done. Later, walking is permitted without crutches, intra-articular pressure being prevented by the brace alone. The next step is the discontinuing of apparatus while in bed, with its re-application each morning. Then the patient is allowed up without the brace for a few hours each day and finally it is discarded all the time. Then daily examination of the joint and the recording of the morning and evening temperatures together with the weekly tabulation of the child's weight over a period of about six months makes it usually safe to pronounce a cure and discharge the patient.

Such a course of treatment demands great patience and attention to detail on the part of the surgeon without any of the glamor accompanying a brilliant operation.

SUMMARY

This following data have been compiled regarding the 130 discharged cases:

Attending school	9
Married	6
Living at home	16

Occupations of discharged cases is known in 36 cases:

Clerical (8); stenographers (3); reporters; advertisement clerk (N. Y. Times); clerk, department store; clerk, shoe store; clerk, clothing store; city clerk, Gloversville; inspector, fountain pen factory; signal worker, railroad; traveling salesman; head storekeeper; electrician's assistant; undertaker's assistant; engineer; repairer, watches; chauffeur (2); auto mechanic; laundry worker; factory, print works; farmer; wire lather ($12 per day); musician; teacher; in industry (2).

During the Great War there were enlisted in the Navy, 1; in the Army, 2.

Average duration of treatment of discharged cases was 3.18 years.

AN UNUSUAL
FRACTURE OF THE FEMUR
WITH KNEE JOINT ANKYLOSIS*

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WHILE there are reported many cases of open comminuted fracture of the femur, complicated by sepsis and delayed union, comparatively few patients go through such an eventful convalescence and with such an acceptable end result as the case here presented.

A young man was injured in a neighboring state on August 21, 1922, as he was demonstrating a mechanical pump, by being suddenly thrown into a gutter and covered over with coal and clay. A part of the machinery hit his left knee. He was dug out and taken to a local hospital where he was found to have four broken ribs on the left side and an open comminuted fracture of his left femur at the junction of the middle and lower thirds. There was said to have been considerable hemorrhage. His abdominal condition was considered satisfactory.

Ten days after the injury the patient was removed to a local hospital where the leg was "set" on a double inclined plane and kept there for twenty-one days, at the end of which period there were no signs of union. There was angulation at the site of the fracture and stiffening at the knee. Traction was applied by means of a Hawley table, and ten days later, a plaster of Paris spica was applied and left on for three weeks. Traction was again applied for ten days and subsequent roentgenograms showed bowing and angulation of the femur and extensive osteoporosis of the ankle bones. He was again put in plaster and transferred to another local hospital where the plaster case was removed and the extremity put in a long posterior wire splint with about 15° flexion at the knee.

Physical examination showed that the lower leg was shiny and slightly edematous. There were numerous scars from old healed pustules about the knee. On the inner side of the thigh there was a scar from an old pressure sore. On the outer side, 4 inches above the knee, there was another pressure sore with a septic granulating surface, the size of a dime. There was a point of false motion in the femur about 5 inches above the knee joint, with a slight posterior bowing (Fig. 1).

The patella was slightly movable and there was 15° motion in the knee. The foot was in toe drop, somewhat puffy, and had but 5° to 8° of involuntary flexion. There was just a flicker of voluntary dorsal flexion. The plantar flexors were present. There was no voluntary inversion or eversion of the foot. A blood Wassermann was found negative.

Three methods of treatment were considered: amputation, bone grafting or a plastic bone operation, or ambulatory treatment with or without operation later, depending upon the progress and outcome of conservative treatment.

Among the consultants called, two reputable surgeons advised amputation at the middle third of the thigh. One well known fracture surgeon expressed the opinion that amputation would save the insurance company expense. The ambulatory treatment was decided upon, and the patient was subsequently discharged from the hospital wearing a ring caliper brace.

Examination in March of the following year showed no swelling of the extremity, the flexion deformity of the knee had almost disappeared, union was slowly taking place, and the patient's general condition was greatly improved. A leather thighlet was made and so arranged as to allow gentle daily manipulations of the knee, baking, and massage. Following the manipulations, the extremity was carefully bandaged with flannel from the toe to the knee to control swelling. Daily dressings of the calf and thigh were necessary on account of the pressure sores described above.

Two months later (April, 1923) the patient's

* From the MacAusland Orthopedic Clinics. Submitted for publication May 7, 1928.

general condition showed more improvement. There was a little more power in the plantar flexors, but there was still considerable limitation of motion in the ankle joint. There were 10° to 15° of motion in the knee. Union at the site of fracture was not yet entirely solid.

FIG. 1. Roentgenogram showing point of false motion and posterior bowing of femur.

FIG. 2. Roentgenogram showing complete union of femur.

The problem of treatment at this period was the correction and prevention of deformity. Therefore, in June, 1923, under ether anesthesia, the posterior bowing of the femur was carefully straightened, the knee manipulated, and the sluggish granulation tissue on the outer side of the thigh curetted. This sinus discharged for several months.

Union was taking place very slowly, and the condition was a true delayed union. Roentgenograms in October showed definite signs of osteogenesis but still there was not a solid union of the fragments. During this period of slow union, the femur bowed repeatedly, so that it was necessary at various times to manipulate and apply a plaster case in order to maintain proper alignment.

In November a plaster model was taken, over which a Thomas ring caliper was made. After the patient wore this for a month, union was much firmer. The foot was at a right angle, the toes were somewhat contracted, there were 5° to 8° motion in the knee, and still some abnormal motion at the site of the fracture.

In January, 1924, there was a little lateral spring in the femur, but no anterior-posterior

movement. Clinically, union had taken place for the first time. The patella was partially ankylosed but the patient was encouraged to use the extremity, to move the knee more and more, and to continue with massage. One month later, there was no spring in the fracture but the knee had a flexion deformity of about 20°.

In March, 1924, union of the femur was solid beyond a doubt, as shown by roentgenograms (Fig. 2). It was considered safe to manipulate the knee under an anesthetic to correct the flexion deformity. A plaster case was applied and removed in three weeks time. The leg splint was again used for a month, at the end of which time it was discarded and weight bearing was begun.

After this long period, necessary to obtain femoral union, it was not unexpected that a "frozen" knee and patella resulted. This situation being present, an arthroplasty according to the technique of MacAusland was done in November, two years after the original injury, and about ten months after all sinuses were healed.

Any arthroplastic measure for an ankylosed joint must be approached with caution, for the outcome must not only give a new joint, satisfactory as to function, but must also be free from pain and sensitiveness and adaptable to weight bearing.

MacAusland's operation[1] may be described as follows:

The usual preparation is given both legs from the ankle to the groin. It is best to remove the fascia from the opposite leg, thereby minimizing the extent of the operation on the ankylosed leg, as well as making it possible to remove more fascia without disturbing the external support of the knee joint. A U-shaped skin incision is made, beginning over the mid-lateral surface on the internal tuberosity of the tibia at the point of its articulation with the femur, passing upward and over the surface of the lower one-third of the thigh in a semicircular direction, to a corresponding point on the surface of the lateral condyle of the tibia. The highest point in the curve comes at a point 1½ inches above the upper edge of the patella. The skin and superficial fat are dissected back a distance of about 1 inch on either side of the incision so as to expose the fascia, quadriceps tendon, and muscle.

A second incision is made through the fascia and quadriceps tendon beginning at a point about 1¼ inches above the highest point of the skin incision arc. This tendon incision is in the form of a short stemmed goblet, the part of the incision corresponding to the bowl of the goblet, following the line of the skin incision. This incision, which is similar to the Bennett incision, is made so as to allow for lengthening of the quadriceps at the time of closure.

The capsule of the patella and its periarticular structures are dissected downward and the patella is chiselled off from the femur, exposing the ankylosed tibiofemoral joint. If the patella is hypertrophied it is best to narrow it down by removing a third of it anteroposteriorly from the outer and inner surfaces.

It is important to leave a well-defined spine between the tibial condyles, and to cup out the upper tibial surface to stabilize the joint and prevent lateral mobility.

In forming the new joint the natural conformation of the femoral and tibial surfaces must be followed. Putti's instruments are excellent for the modeling of the surfaces. The tibia should be separated from the femur by means of a gouge, the diameter of which corresponds to that of the femoral condyle of the adult. First, the external condylar mass of the femur is cut, then the internal, with the instrument inclined at such an angle that an approximate semicircular convexity is formed. As the operation proceeds, an assistant flexes the knee so that the last lamellae uniting the epiphysis of the posterior condylar regions of the femur and tibia are fractured and separated. By means of the same gouge, about 1 centimeter of bone is removed from the femoral epiphyseal surfaces. Two glenoid cavities corresponding to the curvature of the femoral condyles

[1] MacAusland, W. R. Arthroplasty of the knee joint. *Boston M. & S. J.*, 190: 203, 1924.

are made in the tibia. After the surfaces have been carefully modeled, the joint ends are brought together to make sure that

Fig. 3. Photograph showing end result of knee operation.

sufficient bone has been removed. The surfaces must glide smoothly and if necessary more bone may be removed. A space into which the patella will articulate is cupped out. Files and rasps are used to smooth the surfaces. This filing, besides smoothing, drives a bone dust into the spongy parts, which aids in hemostasis, as well as in lubricating the surfaces of the sectioned edges to which the aponeurosis of the transplant will adhere better.

A large piece of fascia lata, ample enough to cover both condyles, both tibial cavities and the under surface of the patella, is removed from the opposite thigh. The fascia nearest the knee on the outer side is thickest and most serviceable. This fascia is sewn over the tibial concavities beginning at the anterior edge and sewing back towards the popliteal space where a loop of fascia is left. The fascia is then sewn over the femoral condyles, up under the quadriceps muscle and the patella, covering all exposed bone. The femur is then adjusted to the tibia, and the patella replaced.

The elongated quadriceps is sutured strongly and the skin closed with interrupted catgut. A plaster of Paris case is applied from the toes to the groin with the knee in 35° to 40° flexion and the leg placed in an elevated position in bed.

The plaster case is split for dressing in two weeks and the leg is placed in a ring caliper with 35° flexion, so arranged that this may be changed and passive motion started slowly. By means of an overhead traction apparatus the patient begins to make passive motions in bed, two or three times a day. The motion should be gentle at first and increased gradually, guided by pain and sensitiveness. Active motions are attempted and, if possible, started about the third to the fifth week.

Massage on the thigh and calf is started in five or six weeks. The patient can usually walk with crutches about the sixth week. No actual weight bearing is allowed until the lateral ligaments have tightened. A caliper may be applied to assist weight bearing, depending wholly upon the sensitiveness and pain on use.

By January, 1925, (two months postoperative) the patient had 40° knee motion while wearing the brace. The knee was perfectly straight. The patella moved freely, there was no lateral mobility, and there were 20° plantar flexion in the foot.

In February, 1925, a tenotomy of the tendo Achilles was done to overcome the equinus deformity which had developed. The knee was gently manipulated at the same time and a plaster case applied, extending from the toes to the groin. Three weeks later the case was removed down to just below the knee and in another three weeks the remainder of the case was removed. At this time there were but 25° motion at the knee. In May the knee had complete extension and there was 20° free painless motion. For the first time motion at the knee with the quadriceps contraction was satisfactory. The foot continued to stay up at a right angle and there was no swelling. Swimming was advised.

In March, 1926, about 8° permanent flexion of the knee had developed but there were about 35° motion. In April, 1927, the patient had about 40° motion at the knee. Stretching exercises, baking, etc. were advised. In June, 1927, the knee was again straight and there were about 40° flexion.

Examination today shows a perfectly stable knee with 50° motion, full extension and good anterior-posterior alignment (Fig. 3).

This case illustrates (1) that bony union sometimes takes not only months but years, the delay being due, as in this case, to severe injury, comminution of fragments, improper immobilization, and sepsis; (2) that conservative treatment is not to be given up as long as the fragments show any sign of joining, and (3) that all operative interference should be delayed until long after the disappearance of sepsis. An opinion had been given by reputable surgeons that the extremity should be amputated, and that conservative treatment was foolhardy.

Attention should be called to the method of approach in this case: (1) consideration was given to secure bony union by complete immobilization; (2 correction of the deformity and (3) treatment for ankylosis of the knee. While the patient was under hospital supervision, the foot was kept at a right angle and it was only after the patient had been away from medical supervision for several months that an equinus deformity developed, necessitating a lengthening of the tendo Achilles.

Meticulous care was exercised in the application of the various splints in order to give proper support to the fracture and at the same time to allow joint motions. This man now has a perfectly stable knee, a solidly united femur and an ankle with good function, all of which bear out the fact that long, persistent and carefully thought-out treatment will in the end usually produce a satisfactory result in such unusual cases.

COMPARATIVE ACTIVITY OF SOME LOCAL ANESTHETICS ON MUCOUS SURFACES OF THE URINARY TRACT*

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IN comparing the different solutions used for anesthesia of the mucous membranes of the urinary tract, we shall consider here only the more common ones. This comparison is based on the most important factors: (1) Toxicity, (2) effectiveness, (3) promptness of action, (4) duration of anesthesia, (5) stability in solution, (6) solubility, (7) primary irritability and (8) antiseptic in solution.

Toxicity is placed first because it is without doubt a most important factor when we recall the number of deaths reported and unreported that have taken place due, not only to absorption from the mucous surface of the urinary tract, but also from the mucous membrane of the eye.

Randall in 1923 published a paper based on his own experience, in addition to replies to questionnaire letters sent to physicians throughout the United States. Six deaths were reported to him due to urethral administration, 5 of which were due to cocaine and 1 to alypin. There were 38 cases of "alarming toxicity," 25 due to cocaine, 5 to novocaine, 4 to procaine and 1 to apothesine. These letters showed a tendency of the profession to discard cocaine for the less toxic anesthetics.

Upon review of the literature dealing with the comparative toxicity of local anesthetics one finds a great variation. The discrepancies in the results obtained by different investigators doing subcutaneous toxicity experiments are undoubtedly due to the difference in the rate of absorption of the solutions from the subcutaneous tissues. The rate of absorption of the local anesthetics when injected subcutaneously or intramuscularly varies greatly in different species of animals. When injected into the same species there is also a marked variation in the rate of absorption depending upon the site of injection. In our opinion intravenous experiments are much more reliable because the toxic action of the local anesthetics is exerted only after the entrance of the drugs into the blood stream.

Figure 1 is based upon results obtained with over 350 albino rats. A 2 per cent solution of the drug in distilled water was injected into the saphenous vein at the rate of 0.1 c.c. in fifteen seconds. At least 5 animals were injected at each dose. The minimal dose at which any of a series dies is considered the maximal tolerated dose. The dose at which the majority of a series dies is considered the minimal lethal dose.

The abscissae represent the number of milligrams of the drugs injected per kilo body weight.

The shaded portions of the ordinates show the maximal tolerated doses, the unshaded portions the minimal lethal doses. The chart shows that butyn is the most toxic. The maximal tolerated dose is 7.5 mg. and the minimal lethal dose 10 mg. The maximal tolerated dose of cocaine as well as the minimal lethal dose is 12.5 mg. The maximal tolerated dose of tutocaine is 22.5 mg. and the minimal lethal dose 25 mg. The maximal tolerated dose of novocaine is 45 mg. and the minimal lethal dose 55 mg. The maximal tolerated dose of novocaine borate is 100 mg. and the fatal dose 110 mg.

In the first column of Table 1 are given the local anesthetics employed; in the

* Read before Section of Genito-Urinary Surgery, New York Academy of Medicine, February 15, 1928.

second column the maximal tolerated and minimal lethal doses for the albino rat in milligrams per kilo body weight; in the third column the strength of the solution injected into the saphenous vein of the rat; in the fourth column the fatal dose for the cat (in the case of tutocaine for the dog); in the fifth column the strength of the solution injected.

The fatal doses for the cat are the results obtained by Hatcher and Eggleston (1919) and Hatcher (1922) and were obtained by their rapid intravenous injection method. The concentration of their solutions varied from 1 to 20 per cent, so that the entire dose could be injected from a syringe in from five to fifteen seconds. The fatal dose of tutocaine for the dog is the result obtained by Schulemann (1924) by injecting a 2 per cent solution into the ear vein in fifteen seconds.

TABLE 1

COMPARATIVE VARIATION IN THE TOXICITY RESULTS OBTAINED IN THE ALBINO RAT AND CAT AFTER INTRAVENOUS INJECTION OF THE ALKAMINE ESTERS OF THE AROMATIC ACIDS USED AS LOCAL ANESTHETICS

Local Anesthetic	Albino Rats		Cats	
	Maximal Tolerated and Minimal Lethal Doses, Mg. per Kg.	Strength of Solution, Per Cent	Fatal Dose, Mg. per Kg.	Strength of Solution, Per Cent
Butyn	7.5– 10	2	15*	1
Alypin	10 – 15	2	10†	5–10
Cocaine	12.5	2	15†	5–10
Isocaine	15	2		
Tropacocaine	15 – 20	2	18–22†	10
Apothesine	20	2	20†	5–10
Beta-eucaine	15 – 25	2	10–12.5†	5
Tutocaine	22.5– 25	2	15–20‡	2
Stovaine	25 – 30	2	25–30†	10
Novocaine	45 – 55	2	40–45†	5–20
Novocaine borate	100 –110	2		

* Fatal dose obtained by R. A. Hatcher. See Bonar, M. L., and Sollman, T. *J. Pharm. & Exper. Therap.*, 18: 475, 1922.

† Fatal doses obtained by C. Eggleston and R. A. Hatcher. *J. Pharm. & Exper. Therap.*, 13: 444, 1919.

‡ Fatal dose obtained on dogs by W. Schulemann. *Klin. Wchnschr.*, 3: 676, 1924.

Effectiveness is second in importance obviously, since we must have as complete anesthesia as possible.

Promptness of action, or rather immediate effect, is desirable to save the time of the busy physician and patient.

Long duration is desirable because it is

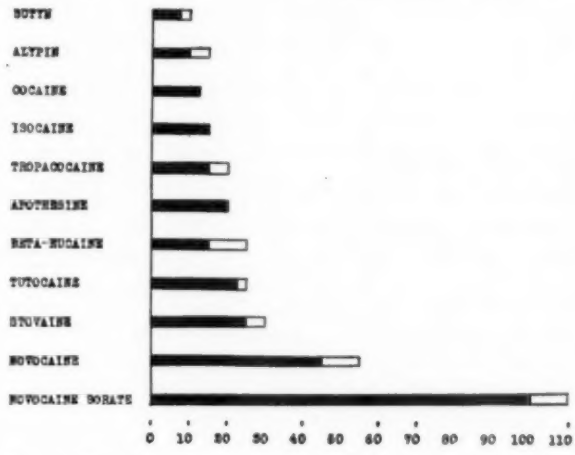

FIG. 1. Showing quantitative comparison of the toxicity of the alkamine esters of aromatic acids used as local anesthetics. Rats injected intravenously. Maximal tolerated (black) and minimal lethal (white) doses in milligrams per kilogram body weight.

helpful to have anesthesia last thirty minutes or longer since it often requires that much time to pass filiforms, dilators, sounds and catheters. Anesthesia to allay the pain and discomfort during the first half hour after inserting an indwelling catheter is also very desirable.

Stable solutions are necessary from an economic standpoint for much time is wasted where it is necessary to make solutions daily and much material wasted where the solution is discarded after standing for a short time.

The factor of *solubility* may be regarded in the same light as stability.

Antisepsis is a new and important factor. Novocaine borate alone is antiseptic. In the 2 per cent solution which is ordinarily used we have a 1 per cent solution of boric acid which is sufficient to prevent the growth of the common types of pathogenic bacteria. Chemically novocaine borate is the borate of para-aminobenzoyldiethylamino-ethanol and was first described by Einhorn and Uhlfelder in 1910.

Novocaine borate contains approximately 50 per cent novocaine (base). It is a fine white, odorless powder, freely soluble

in water and the solutions can be sterilized by boiling and will remain stable for days.

Copeland and Notten in 1905, in a report dealing with "The Borocaines" (the boric acid salts of the local anesthetics), found the anesthetic efficiency of novocaine borate on the rabbit's cornea greater than that of cocaine in similar equivalent concentration. Coyte in 1926 employed it as a urethral anesthetic and found that 1 per cent solution of novocaine borate (borocaine borate) gave better anesthesia than an 0.5 per cent solution of cocaine or a 2 per cent solution of novocaine hydrochloride.

Novocaine borate hydrolyzes when dissolved in water and acts as an aqueous solution of boric acid to which has been added novocaine (base). Surface anesthesia is determined by the base in the free dissolved state and not by the electrolytically ionized base.

Aqueous solutions of novocaine borate are alkaline to litmus and therefore should not be used for infiltration or conduction anesthesia where the solution is injected beneath the skin.

We have also used tutocaine, the hydrochloride of para-aminobenzoyl-dimethylamino beta-methyl-isobutanol, a homologue of novocaine. It was prepared by Schulemann in 1922. It is a whitish crystalline powder freely soluble in water. The aqueous solutions are neutral and colorless and may be sterilized by boiling for a short time. Tutocaine has been studied pharmacologically by Schulemann, Copeland, and Watson-Williams.

The Council on Pharmacy and Chemistry of the American Medical Association admitted tutocaine to New and Nonofficial Remedies in 1926. The Council states that when correctly used it rapidly produces complete and prolonged anesthesia and is effective even in relatively low concentration. For urethral anesthesia, 0.5 to 1 per cent solutions, increased to 2 per cent in very painful procedures, are recommended.

The urological literature contains favorable reports by Frisch, Blum and Glingar, Schirokauer, Chetwood and Cooney, Kingston and Bristol, Siedner and others. All are agreed that tutocaine is a reliable mucosal local anesthetic.

Our own experience with tutocaine has been equally as satisfactory and when we remember that tutocaine stands fairly low in toxicity, acts rapidly and effectively on mucous surfaces, and may be used beneath the skin as well, we feel it to be an excellent anesthetic.

We have used novocaine borate extensively as an anesthetic for all types of instrumentation such as passing of sounds, cystoscopes, catheters and for anesthesia of irritable bladders preceding irrigation. (*It must be remembered that it cannot be used under the skin.*)

In our experience novocaine borate is the most satisfactory mucous surface anesthetic for the following reasons: (1) Least toxic; (2) equally effective; (3) action quick (one minute); (4) solution stable; (5) solution may be boiled; (6) antiseptic.

TABLE II

COMPARISON OF NOVOCAINE WITH NOVOCAINE BORATE*

Novocaine		Novocaine Borate	
Advantages	Disadvantages	Advantages	Disadvantages
1. Slightly toxic	1. Very slow action	1. Very slightly toxic.	1. Cannot be injected beneath the skin.
	2. Action not thorough.	2. Rapid action.	
		3. Antiseptic in solution.	
		4. Very thorough action.	

* This comparison is made between the two least toxic of the anesthetics we have used.

SURGICAL PATHOLOGY OF GOITER

A COMPARISON WITH THE CLINICAL PHENOMENA IN 173 CASES*

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NEW YORK

THERE has been considerable difference of opinion concerning the classification by pathologists of lesions of the thyroid gland. There has been as much divergence, perhaps, among clinicians concerning the classification of the clinical types of thyroid disorders. When attempts were made to correlate the pathological findings with the clinical syndromes greater confusion ensued, because in the effort to make the two unsettled classifications dovetail a hybrid terminology resulted that left matters in a state bordering on chaos. It was especially in that group of clinical cases variously known as Basedow's disease, Graves' syndrome or exophthalmic goiter that the sharpest differences of opinion arose.

Thus Wilson[1] concluded from his observations on a large series of human thyroid specimens removed at the Mayo Clinic that not only did the glands in cases of Graves' disease present characteristic pathological pictures but that from the latter the clinical severity, stage and duration of the disease could be predicated in 80 to 90 per cent of cases. Plummer[2] of the same clinic found that of glands reported as primary hyperplastic by the pathologist 99.2 per cent were from patients with Graves' disease, and he therefore maintained that the symptom complex should be ascribed to disturbed thyroid function. Of the non-hyperplastic specimens 23.3 per cent were from patients with toxic symptoms without exophthalmos; in these, therefore, the symptom complex could not be attributed to any definite change in the thyroid gland. About one-third of these simulated Graves' disease clinically.

Wilson[3] subsequently studied the specimens from the toxic (non-exophthalmic) group of patients. He found that in these closely simulating Graves' disease (Plummer's Group 2) 50 per cent showed what he termed "secondary or regenerative hyperplasia," while in those with cardiac manifestations (Plummer's Group 1) only one-eighth or 12½ per cent, showed such changes. He concluded that there is an association of increased thyroid secretion and absorption with the degree and type of toxicity of the patient.

Marine[4] and his collaborators,[5] on the other hand, concluded from studies upon the thyroid of dogs and sheep in the Lake districts, that hyperplasia is a physiological reaction to a demand from the tissues and essentially an expression of iodine deficiency, as the iodine content of the gland varies inversely with the degree of hyperplasia. Upon the administration of iodine for two or three weeks the hyperplastic gland reverts to the colloid state, the iodine content varying directly with the amount of colloid. Colloid goiter is therefore the quiescent stage after the iodine deficiency has been met and is the state nearest to normal which a hyperplastic gland can attain.

They pointed out that whereas great anatomical changes in the human gland may occur in a short time, clinical phenomena do not necessarily change as rapidly, e.g., the typical active hyperplasia of exophthalmic goiter may revert to the pure colloid state in a month. They emphasized the fact that hyperplasia in both humans and animals may be engrafted on normal glands or on colloid glands (involuted hyperplasias). While the changes in Graves' disease form the familiar

* From the laboratories of the Mount Sinai Hospital, New York. Submitted for publication July 24, 1928.

type of hyperplasia, it is not the most frequent, for the same histological changes occur in prenatal, childhood, puberty and pregnancy enlargements. In the seacoast areas the primary forms of hyperplasia are more frequently observed than in the goitrous areas because in the latter preceding hyperplasias and subsequent involutions to the colloid state occur commonly. They classified the human thyroid glands which they studied[6] into nine groups and in analyzing the specimens from 69 cases of exophthalmic goiter[7] found that they fell into five of these groups: (1) Normal and normal-colloid, 5 cases, (2) hyperplasias, primary or secondary, 43 cases, (3) colloid goiter, 18 cases, (4) adenomata, 8 cases, (5) old complicated goiters, 4 cases. The involution to the colloid goiter state occurred either spontaneously or as the result of iodine administration. In 5 of the adenomata the surrounding thyroid tissue was in the colloid state, indicating a preceding hyperplasia, the adenomata bearing no relation to the symptom complex.

It is evident that from these studies a rather sharp diversity of opinion arose between two groups of investigators as to the parallelism between the clinical symptomatology and the pathological anatomy of thyroid disorders and as to the relationship of thyroid hyperplasia to Graves' syndrome (cause or effect). Marine and his collaborators,[8] applying their observations upon the parallelism of iodine content with histological structure of the thyroid, demonstrated that the administration of small amounts of iodine prevented the development of simple goiter in goitrous areas, by supplying the necessary iodine to forestall the compensatory hyperplasia that occurs as a result of iodine deficiency during adolescence, pregnancy and fetal life.

Marine, moreover, noted the involution of the hyperplastic gland of Graves' disease to the colloid state either spontaneously or after the administration of iodine. Plummer[9] advocated the use of Lugol's solution for a period of ten to fourteen days prior to operation for exophthalmic goiter, and found that this therapy caused a rapid reduction in the basal metabolic rate and an improvement in the condition of the patient. The frequent preliminary operations of ligating the polar vessels before proceeding to subtotal thyroidectomy became almost obsolete. Giordano and Caylor[10] studied the effect of polar ligations upon the thyroid and found that in the cases showing a clinical improvement from this procedure the tissue near the ligated poles showed involution to the colloid state. Reinhoff[11] and Cattell[12] presented the histological changes after iodine administration in well controlled surgical cases, specimens being removed before and after such therapy. The primarily hyperplastic gland of Graves' disease showed involutional changes which at times amounted to a complete return to the colloid state. Cattell, moreover, studied the iodine content in 371 thyroid specimens removed at Lahey's Clinic confirming the earlier work of Marine, and noting especially the involution in the gland of Graves' disease after the administration of Lugol's solution. The effect of the drug upon the gland structure may begin in four days; the maximum influence rarely occurs in less than a month, more commonly in two months. The mass of evidence is therefore in favor of Marine's belief that all hyperplasias are of similar nature and are all similarly altered by the administration of iodine.

In connection with the clinical studies made on the medical service of the Mount Sinai Hospital by Dr. Kessel and Dr. Hyman and on the surgical service by Dr. A. V. Moschcowitz we compared the pathological findings with the clinical diagnosis in 173 cases of thyroid disease subjected to operation, to determine in what measure they were compatible. It seems hardly necessary to emphasize the fact that in the study of purely operative material observations can be made only on the tissue removed and submitted for

examination, and that nothing should be deduced as to the state of that part of the thyroid gland left *in situ* by the operator

ADENOMATA

The first group of specimens consists of the benign new formations the adenomata.

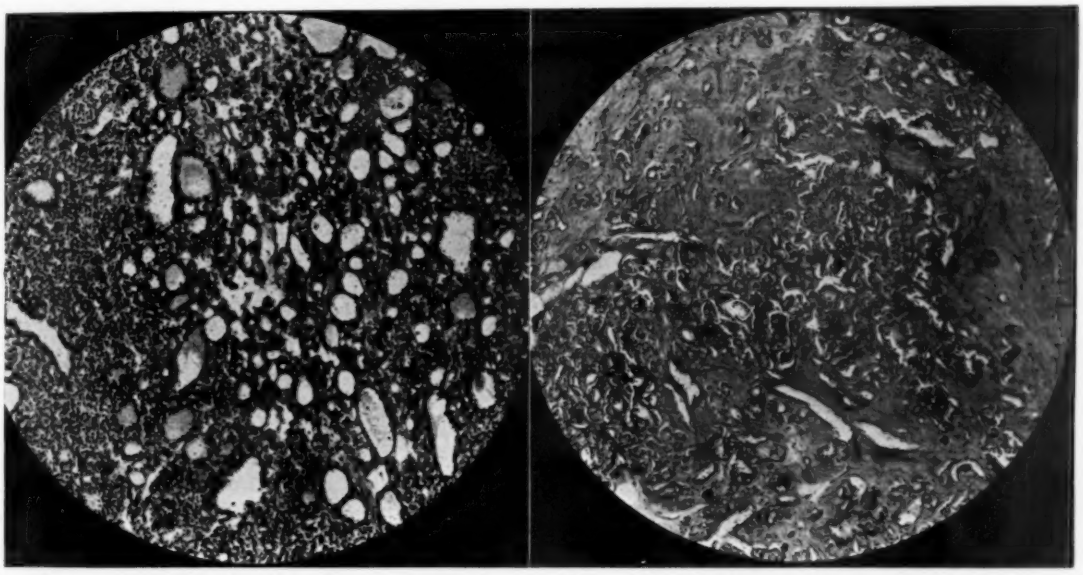

Fig. 1. Fetal adenoma. Weight of specimen 30 gm.

Fig. 2. Fetal adenoma encountered in a hyperplastic thyroid gland from a case of Graves' disease. Weight of specimen 45 gm. B.M.R. +50.

in those instances in which well encapsulated tumors (adenomata) have been enucleated from the gland without resection of the adjoining parenchyma.

The pathological data were based upon a gross description of the specimen including measurements and weight, and microscopic examination of tissue from several representative areas of the gland or enucleated tumor. In the classification of the lesions it soon became apparent that we had to distinguish sharply, as pointed out by both Marine and Aschoff,[13] between the localized processes, i.e. tumor formations, and the diffuse changes in the thyroid gland substance dependent upon constitutional factors whether physiological or pathological in nature. The complicating factors of degenerative phenomena such as hemorrhage, fibrosis and calcification must be relegated to the background in attempting to correlate pathological and clinical data. In some specimens the diffuse changes in the gland are, moreover, associated with the formation of adenomata especially in old colloid goiters, and these too, should be regarded as of secondary importance.

They are well encapsulated, globular, varying in size from a few millimeters to 10 or more cm. in diameter, and may be single or multiple. They may be so numerous as to make up almost the entire mass of thyroid tissue compressing the glandular substance between them, a condition to which the term adenomatosis has been applied. Histologically they vary greatly. They may consist of solid masses of compact cells arranged in cords or strands, or small alveoli containing either no secretion at all or only a small amount of deep staining inspissated colloid. These are usually referred to as fetal adenomas, according to Wölfler, who attributed their origin to fetal rests. Aschoff believes, however, that they arise almost without exception from the incompletely differentiated central canaliculi, the growth centers of the normal thyroid lobules from which the other follicles of the thyroid have arisen. Both Marine and Aschoff believe that these adenomatous rests or growth centers show an active development in the periods of general physiologic enlarge-

ment of the gland, but in the goiter areas these foci do not participate in the regression which normally follows, but continue to grow throughout life and dominate the pathological and clinical picture. Thus the problem of preventing nodular or adenomatous goiter appears to be bound up with that of the prevention of diffuse glandular enlargement. Marine[14] has stated that adenomas do not occur in otherwise normal glands, and has found that the prevention of hyperplasia by iodine administration in school children has also prevented the development of adenomata.

These adenomata may, on the other hand, be of the simple colloid or adult variety. In this case they consist of well-encapsulated nodules or masses of thyroid tissue made up of large acini, filled with colloid the epithelium of which is extremely flattened except perhaps, as Aschoff has indicated, at the growth point of the individual acinus. Histologically one frequently cannot distinguish such tissue from that of the second group of specimens, the diffuse colloid goiters. The gross description of the specimen is, therefore, extremely important in arriving at the diagnosis. Both the fetal and adult varieties of adenoma are subject to secondary changes such as hemorrhage, cystic degeneration, fibrosis and calcification, processes which occur in the later stages of their growth and development. They may, moreover, undergo malignant changes, and according to some observers 90 per cent of carcinomata of the thyroid have their origin in adenomata, especially those of the fetal variety.

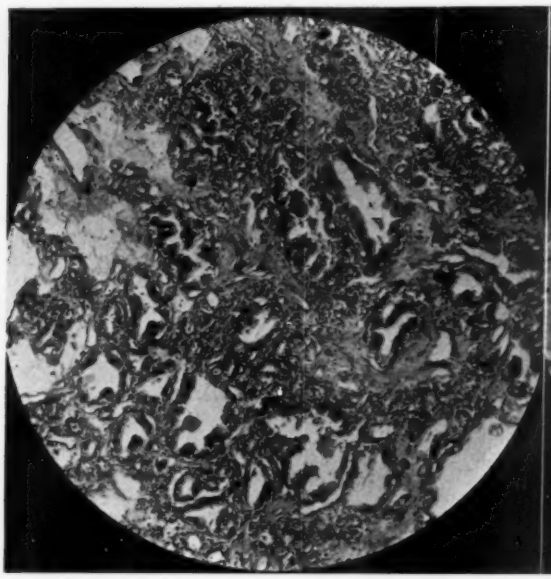

FIG. 3. Hyperplasia in fetal adenoma shown in Figure 2.

FIG. 4. Colloid adenoma showing germinal hill or growth center of the acini. Weight of specimen 220 gm. B.M.R. normal.

Of the specimens examined in this series of 173 cases submitted to surgical intervention 70 were adenomata, single or multiple (adenomatosis). In 65 the preoperative diagnosis of simple or adenomatous goiter was made and was therefore compatible with the pathological findings. In 7 of these 65 cases, however, the basal metabolic rate was elevated (+15 or over) but definite clinical phenomena of Graves' disease were wanting. One patient with a basal metabolic rate of +15 was diabetic. Four patients had either a single determination of +17 or less, or repetition of the test yielded normal readings. In only 2 was the elevation of the rate definitely abnormal, namely +28 and +36, and one of these received and responded to iodine therapy prior to operation.

In the remaining 5 cases, however, the clinical diagnosis was Graves' disease with basal metabolic rate elevated from +19 to +42. In 1 case with basal metabolic rate +24 the resected gland contained a large colloid adenoma, the thyroid tissue itself being in the colloid state but showing areas of secondary hyperplasia. In another case with a basal metabolic rate +42, a patient with substernal goiter of years' duration and with auricular fibrillation, a large cystic adenoma with calcification was removed. On section areas of secondary hyperplasia were also seen in this specimen. Neither patient presented exophthalmos. In 2 other cases without exophthalmos but with basal metabolic rate of +19 and +32 respectively the resected glands showed multiple adenomata with degenerative changes (adenomatosis). The fifth case with basal metabolic rate of +35 and the clinical signs of Graves' disease had a substernal adenoma removed. It is difficult to classify these cases clinically. They correspond to the "formes frutes" or Basedowoid cases of earlier writers, and to the adenomata with toxic symptoms of later writers. Recently a tendency to revert to the former view has appeared. Thus Graham[15] opposes Plummer's classification of adenoma with simple hyperthyroidism in contradistinction to the dysthyroidism of Graves' disease, and maintains the identity of the two diseases. We have had no convincing evidence either clinical or pathological of the existence of toxic adenoma as an entity apart from Graves' disease.

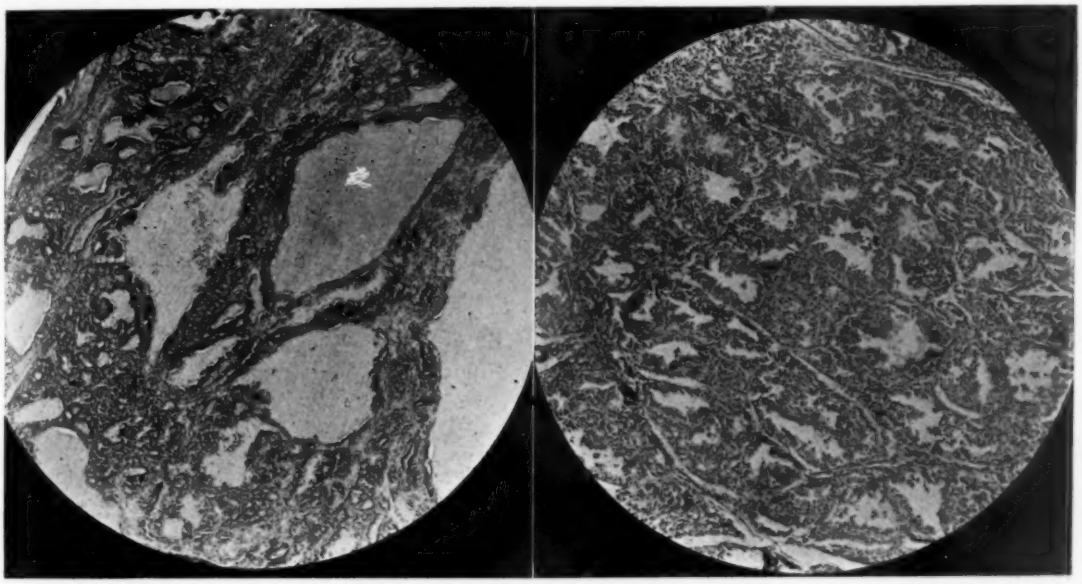

Fig. 5. Large substernal adenoma with areas of hyperplasia. Male, aged thirty-six; goiter fifteen years; symptoms of Graves' disease three years. B.M.R. +42.

Fig. 6. Hyperplasia, moderate. Female, aged fifty; Graves' disease eight months. B.M.R. +30. Weight of specimen 31 gm.

The presence of proliferative or hyperplastic changes was noted in 13 of the 70 adenomata but seemed to bear no constant relationship to the basal metabolic rate. In 3 cases iodine was administered before operation but no definite influence was observed. In 1 case of adenomatosis referred to, Lugol's solution was administered for eight days, the basal metabolic rate declining from +32 to +19.

COLLOID GOITERS

These comprise the second group of specimens, 18 in number. Subtotal thyroidectomy was performed in these cases and the removed tissue presented a diffuse change in the thyroid gland substance. The follicles were enlarged and distended with viscid colloid, and the acinar epithelium

was flattened throughout. No specimen showing areas of hyperplasia was included in this group; in other words only those in which complete involution had occurred either spontaneously or as the result of iodine administration were placed in this category. A great discrepancy is seen in this group between the clinical diagnosis and the pathological findings if one maintains that the evidence of hyperplasia or regenerative changes are essential to the diagnosis of Graves' disease. In 7 cases all the characteristic clinical signs of that syndrome including increased metabolic rate were observed, but no hyperplastic changes were observed in the resected gland tissue. In only 3 of these could the complete involution be ascribed to the administration of iodine. In 11 the clinical diagnosis was simple or colloid goiter. In 8 of the 18 specimens adenomata were present in the colloid gland. In 2, both cases of Graves' disease, lymphocytic infiltration was observed.

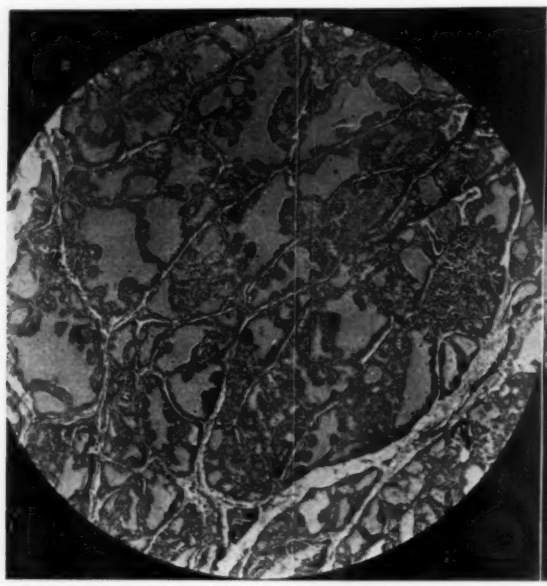

FIG. 7. Hyperplasia with areas showing considerable colloid. Female, aged sixteen; Graves' disease five months. B.M.R. +25 Lugol's solution before operation. Weight of specimen 75 gm.

FIG. 8. Colloid gland with small residual areas of hyperplasia. Female aged thirty-six; Graves' disease two years, aggravated three months. B.M.R. +60. No iodine. Weight of specimen 27 gm.

HYPERPLASIAS

The third group of specimens, 78 in number, comprises those cases in which subtotal thyroidectomy was performed, and in which that diffuse change in the thyroid gland structure was observed which is generally recognized as hyperplasia. As Marine has so amply demonstrated hyperplasia is the structural response of the thyroid gland to a physiological need, more specifically iodine deficiency. As that need is met the gland gradually involutes to the colloid state, the complete involution being recognized as the diffuse colloid goiter, the group which we have considered in the preceding paragraph. It naturally follows that all degrees of hyperplasia will be encountered in these specimens and wide variations in the histological picture observed in different parts of the same specimen. As a rule the reversion to the colloid state will be seen first in the center of the thyroid lobules. In glands which have once been through the complete cycle of changes, secondary hyperplasia will be first observed in the periphery of the lobules. It follows, moreover, that the extent of involution to the colloid state varies inversely to the extent of the hyperplasia and vice versa. The specimens may therefore be graded

TABLE I

INFLUENCE OF IODINE THERAPY ON THE HYPERPLASTIC THYROID GLAND OF GRAVES' DISEASE

Cases	Amount of Colloid					
	None	Small Amount	Total	Moderate	Large Amount	Total
No Iodine given 32.....	15	11	26	0	6	6
Iodine given 46.....	2	12	14	9	23	32

TABLE II

Pathology	Number of Cases	Clinical Diagnosis		Basal Metabolism		
		Agree	Disagree	No Reading	Not Elevated	Elevated
Adenomata.....	70	65	5 (Graves')	21	37	12
Colloid goiter.....	18	11	7 (Graves')	4	6	8
Hyperplasia.....	78	75	3	0	1 (+6)	77
Carcinoma.....	6	4	2 (1 Graves') (1 adenoma)	2	3	1
Tuberculosis.....	1		1 (carcinoma)		1	
	173	155	18			

either in terms of hyperplasia, or of colloid content, or of iodine content, for as has been pointed out, the iodine content varies directly with the amount of colloid and inversely to the degree of hyperplasia.

Every one of these specimens was removed from a patient with Graves' disease, although clinically one was suspected of carcinoma. In 2 the symptoms were mild and the clinicians diagnosed adenomatous goiter, because the gland contained a palpable adenoma. The opportunity was afforded us, moreover, to observe the effect of the administration of Lugol's solution upon the thyroid gland in Graves' disease because in the first part of the work it was not administered prior to operation, whereas in the later cases it was regularly so employed. As will be seen from Table 1 the appearance of the gland during the first period was usually that described as typical of Graves' disease, a small dry, fleshy, lobulated, parenchymatous gland closely resembling a section of the pancreas. Of 32 specimens, 26 presented this appearance. During the second period, however, conditions were reversed. Of 46 specimens, 32 were large glands, made up of large lobules, increased fibrous septa between them, the acini filled with colloid and the whole presenting a moist glassy surface on section.

Only 9 specimens in this group contained adenomas, 6 of which showed hyperplastic changes or proliferation. No definite evidence of susceptibility of the hyperplastic adenomata to the administration of iodine could be made out.

CONCLUSIONS

In Table II a summary of the pathological findings in relation to the clinical diagnosis in 173 cases of goiter is given. The pathological and clinical findings were compatible in 155 instances, about 90 per cent. Of 88 cases presenting the clinical characteristics of Graves' disease, hyperplasia of the thyroid gland tissue was observed in 78 instances, about 88 per cent. We believe that the broad viewpoint of Marine concerning the physiology of the thyroid gland and the relationship of iodine deficiency to hyperplasia is

correct in every way. On the other hand, we believe that hyperplasia in the human thyroid, occurring at a time when there is no normal demand for it, is an essential part of the pathology of Graves' disease at its onset. We are, moreover, convinced that the complete involution of the gland occurring as it may in the natural course of the malady, or rapidly induced by the administration of iodine, is not indicative of cure nor of permanent improvement in the clinical course. It follows from the fact that the disease is not necessarily cured when such involution does take place, that the thyroid gland alterations are not primary, but nevertheless are important in the pathology of the disease. While in view of all the known facts hyperplasia of the thyroid gland is not synonymous with Graves' disease, its high incidence in the specimens removed from such cases (88 per cent in this series) is a finding of practical value for both the pathologist and the clinician.

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DUODENAL DIVERTICULA

WITH REPORT OF TWO CASES*

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DEFINITION

DIVERTICULA of the duodenum may best be defined as simply pouches or pockets arising from the duodenal wall and having a free communication with the duodenal lumen.

HISTORY

While this condition has been noted for several years, it has only recently come to assume clinical importance. The use of the roentgen-ray in the study of the gastro-intestinal tract has led to the discovery of many of these diverticula which would probably not have been found otherwise. The first case report was made by Chomel in 1710.[1] This case showed gallstones in the diverticulum. Two similar cases have been reported by Harley in 1875 and Cole and Roberts in 1920.

Larimore and Graham[8] state that from the report of the first case in 1710 to 1910, the condition was only discovered post-mortem or at operation and was considered rare. For two-hundred years diverticula of the duodenum were of academic interest to the anatomists, the prosectors, and occasionally the surgeon. Increasing use of the roentgen-ray in examining the intestinal tract provided descriptions of the condition in the literature of 1910 to 1915. Little was said of clinical importance or of operative procedures in treatment. The first operation on a previously diagnosed case was in 1915, by Forsell.

The literature has been extensively reviewed by various writers, among them Andrews,[2] Moore,[3] Cole and Roberts,[4] Downes,[5] Ritchie and McWhorter,[6] and others. No attempt at a complete review is made in this paper.

INCIDENCE

Nagel[7] in 1925 stated that duodenal diverticula were found in 2.2 per cent of necropsies at Mayo Clinic between July, 1922, and February, 1924. Fourteen were of the single pocket type and 6 of the double pocket type. Ages varied from thirty-three to eighty-seven, males slightly predominating.

Up to January, 1924, 27 cases had been operated at the same clinic, according to Hunt and Herbst.[1]

Incidence varies from different sources:[8] Linsmayer, 7 per cent; Spriggs, 3.8 per cent; Buschi, 3 per cent; Case, 2 per cent; Andrews, 1.2 per cent. Larimore[8] reports 0.5 per cent (19 in 3446 cases). Hence, it is to be seen that the condition is sufficiently infrequent to warrant reports of cases and to call the attention of practitioners to this condition as a possibility in cases exhibiting atypical symptoms of upper abdominal pathology.

CLASSIFICATION AND PATHOLOGY

Diverticula may be classified as:

1. True.
   a. Congenital.
   b. Acquired.
2. False or pseudo-diverticula.
   a. Congenital.
   b. Acquired.

The true and false congenital types arise as pockets or pouches from the enteric tube as it rotates to the right to form the duodenal loop. The multiplicity of peritoneal attachments and the complexity of structures in relation to the duodenum offer a fertile hatchery for embryological freaks. It is rather unusual that more congenital anomalies are not seen in this region than have been noticed.

* From the Wise Clinic, Americus, Ga. Submitted for publication August 17, 1928.

The most common sites appear to be the second and third portions, some of the third portion cases having the diverticulum lying buried in the pancreas. A true diverticulum arising from the duodenal bulb is rare, and if the roentgenological findings afford any doubt as to the presence of a diverticulum at this site, the case had best be regarded as one of ulcer with accessory pocket, until proved otherwise.

The true diverticula of congenital type usually contain in their walls all the structures of the intestinal wall, namely—mucosa, submucosa, musculature and peritoneal coat, although the amount of musculature may vary considerably. Where the pouch is extremely shallow, or where there is simply a redundancy of the true wall, we have the condition known as a false or pseudo-diverticulum. These false diverticula have also been defined as those in which the muscular wall is lacking.[8]

The pseudo-diverticula are impossible often to differentiate from the true type, except at operation or necropsy.

Diverticula containing gallstones, are occasionally seen, as in the cases previously mentioned. This finding is more likely in the rather rare condition of cholecyst-diverticular fistula.[1]

Malignant changes may occur in the diverticulum, as in a case reported by Morrison and Feldman.[9] In their case, the roentgenological examination was reported as "suggestive of upper right quadrant adhesions, probably gall bladder in origin." Operation showed a normal gall bladder, duodenal adhesions, and a duodenal diverticulum arising from the junction of the duodenal bulb with the first portion. In the mouth of the diverticulum was a small indurated mass, diagnosed carcinoma. The liver and adjacent glands showed metastases. Later, autopsy and histological examination of specimens showed a primary carcinoma of the diverticulum with metastases.

The size of the diverticula may vary from that of a small pea to several centimeters in length, a fact which makes obvious the necessity of careful study of any unusual appearance in the contour of the duodenal wall during routine roentgenological examinations.

The frequency of association of the diverticulum with ulcer of the duodenum makes this condition one of marked interest.[8] Often the ulcer is situated on the wall of the duodenum opposite to the mouth of the diverticulum. Again the type associated with ulcer is very prone to the occurrence of an inflammatory process or diverticulitis. It is this diverticulitis which may produce symptoms referable to ulcer where no ulcer actually exists.

Monsarrat[10] reports a case of acute perforation of a duodenal diverticulum.

CLINICAL SYMPTOMATOLOGY

There is no definite clinical picture accompanying this condition. There may be pain, especially of the type unrelieved by food; acid eructation nausea and even vomiting. The general symptomatology may resemble cholecystitis or cholelithiasis, gastric or duodenal ulcer, duodenitis, pancreatitis, duodenal ileus, or even gastric disturbances reflexed from a chronic appendix. It is this very lack of definite symptomatology which should cause one to keep in mind the possibility of this lesion in cases which exhibit vague and atypical upper abdominal symptoms.

Of all confusing clinical pictures, cholecystitis, duodenal ulcer and duodenitis are probably the three most commonly simulated by the lesion under discussion.

DIAGNOSIS

The condition may be suspected and kept in mind in all cases where symptoms point to upper abdominal pathology. The ulcer case that shows confusing points in history, physical and laboratory findings, the gall-bladder case that is atypical, the duodenitis case that seems a bit uncertain diagnostically—any of these may present a diverticulum of the duodenum as the offending lesion.

The primary diagnostic agent is the

roentgenological examination of the gastrointestinal tract, in the course of which the diverticulum may be recognized as such. Care must be taken to avoid confusion with a mere redundancy of the duodenal wall, with accessory ulcer pockets, or with jejunal diverticulum.

Fluoroscopic observation is essential, especially in distinguishing from redundancies. The writer has found that films made in the right oblique position (i.e., half lateral with the patient on the right side), furnish the most valuable information as to the contour of the duodenal loop, and uses this position routinely in all gastrointestinal studies.

The observation of barium retention in the diverticulum at four or five hours, and occasionally at twenty-four and forty-eight hours, is of value in establishing the diagnosis.

Second only in importance to the barium meal studies is the procedure of cholecystography, as devised by Graham and Cole. This examination often brings to light a cholecystitis or cholelithiasis, and it has been noted that the association of gall-bladder disease and duodenal diverticula is a rather common one. All cases showing diverticula should be further examined by cholecystography. In some cases it may be of advantage to fill the stomach and duodenum after obtaining a dye outline of the gall bladder, in an attempt to establish any relation between the duodenal deformity and the gall bladder.

When other upper abdominal lesions are ruled out, and a duodenal diverticulum is found to be present, we may feel reasonably safe in ascribing certain symptoms to the diverticulum. However, its presence may mean nothing more than the presence of an interesting anatomical anomaly, and the connection with symptoms may be remote or absent. Such a situation furnishes need for sound clinical judgment and logical reasoning, based on the elimination type of diagnostic procedure. One must make up his mind as to whether the little pouch demonstrated on the roentgenogram is a lion or a lamb.

TREATMENT

Treatment is based on the last-named decision. In case one decides the diverticulum is the offending lesion, and symptoms necessitate early relief, operative treatment is indicated. If other factors are considered contributory to the causation of symptoms, the contributory pathology may be treated as indicated and the case further observed before operative procedures on the diverticulum are carried out. Cases presenting a picture suggestive of abdominal malignancy warrant immediate exploration to determine the relation of the duodenal diverticulum to the symptoms, provided, of course, that operation is feasible. It is not within the scope of this paper to discuss the various methods of approach surgically. In general it may be stated that ligation and excision of the diverticulum, with invagination of the base and suture, is the usual method employed. McClean[11] describes a technique for removal of diverticula imbedded in the head of the pancreas or in the retroperitoneal space.

In case it is desired, for various reasons, to handle the condition medically, treatment based on that for duodenal ulcer is most likely to give uniformly good results, in view of the fact that the presence of an inflammatory process, or diverticulitis, is a frequent occurrence in these cases. Any diet which will secure alkalinization with little gas should prove helpful. The use of belladonna is indicated if the roentgenological examinations show presence of spasm of the pylorus or duodenum along with the presence of the diverticulum. In cases exhibiting definite clinical and roentgenological evidence of colonic stasis, treatment of the stasis may cause a relief of the upper abdominal symptoms, thus throwing doubt upon the rôle of the diverticulum in the causation of the symptoms. In general, it may be stated that a conservative, common sense method of approach in the handling of these cases

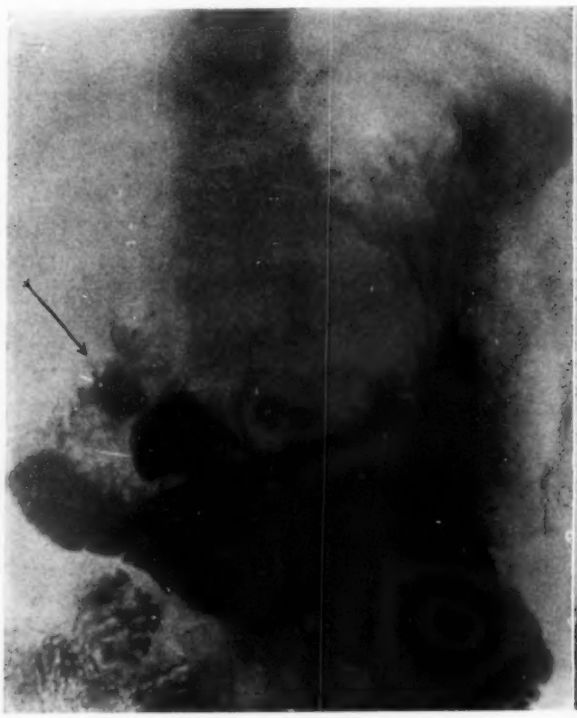

FIG. 1. Case 1. Diverticulum seen above and to right of duodenal bulb. Patient prone.

FIG. 2. Case 1. Diverticulum seen hanging from loop of duodenum. Oblique position.

is equally as important as a logical procedure in diagnosis.

CASE REPORTS

The following 2 cases are added to the reports in the literature, not primarily because they are unusual examples of diverticula but because they serve to illustrate the two general types of these cases hitherto mentioned, namely, (1) diverticula responsible for symptoms and (2) diverticula not responsible for symptoms. Positive findings only are listed and the histories are made as brief as possible, consistent with clarity.

CASE 1. White female, aged thirty-eight years, admitted to Wise Sanitarium, Plains, Georgia, service of Dr. B. T. Wise, October 18, 1928, with chief complaint of pain and soreness in abdomen.

Family History. Father died, aged seventy-seven, of "cancer of stomach."

Present History. Inflammation of bowels for past eight or nine years (manifested by gas, moderately severe upper and right lower abdominal pain). No history of bloody or mucoid stools. Patient constipated and takes laxatives frequently. Has lost some weight in last few weeks, which patient ascribes to dieting.

Operations: Tonsillectomy and uterine curettage five years previously.

FIG. 3. CASE 1. Retention of barium in diverticulum at six hours.

Present Illness. Onset five to six days before admission with soreness in right lower abdomen. Very little nausea, but patient has vomited once or twice since onset. No other symptoms.

Physical Examination: Abdomen moderately distended and tympanitic. Tenderness over entire colon. Some tenderness over McBurney's point.

Urinalysis: 3 plus indicanuria.

Blood: W.B.C. 11,250, 83 per cent, P.M.N. on October 18, 1928. W.B.C. 11,120, 86 per cent P.M.N. on October 19, 1928.

Diagnosis of acute appendicitis and enteritis was made at this time and operation advised. Patient refused operation. Dismissed from hospital after five days, feeling much better.

From October, 1926, to February, 1928, when first seen by the writer, she has had more or less upper abdominal discomfort, considerable accumulation of gas after eating, slept poorly and failed to gain any weight.

Roentgenological examination of the gastro-intestinal tract on February 6, 1928, gave the following results:

Heart, aorta and diaphragm normal. Esophagus, normal. No cardiospasm.

Stomach of long, ptosed type, but peristalsis and tone good. There is marked spasm in region of pyloric antrum and sphincter, with an irritable duodenum. A dense clump of barium is noted lying in region of second portion of duodenum. Examination in oblique position shows a pedunculated extension from the loop of the duodenum, the distal extremity of which is about as large as the thumb nail. The pocket is seen to fill from the duodenum under fluoroscope. Duodenal cap shows no evidence of lesion, other than irritability.

At six hours, the stomach is empty, meal head normally advanced along a ptosed colon, but barium clump persists in upper abdomen to right of midline.

At twenty-four hours, the cecum shows little stasis, but transverse and descending colon shows considerable stasis. Transverse colon ptosed. Appendix not visualized, and very little cecal tenderness. A small amount of barium persists in upper abdomen in same area as noted at six hour observation.

At forty-eight hours, there is moderate colonic stasis and a trace of barium clump remains in upper abdomen. Appendix not seen and there is very little cecal tenderness.

Reexamination of the stomach, after giving atropine to full physiological effect, showed a diminution in the spasm of antrum and sphincter, but persistence of the accessory pocket of the duodenum.

Conclusions: Gastro-enteroptosis. Coloptosis.

Spasm of pars antra and pylorus.

Duodenal diverticulum, second portion.

Colonic stasis. No definite evidence of appendiceal pathology. (Fig. 1, 2, and 3.)

The patient was advised to have the diverticulum removed, but refused operation. Medical treatment, consisting of diet, belladonna, magnesia-mineral oil, was instituted. At present time, May 26, 1928, there has been slight improvement in the amount of abdominal pain and gas, but no gain in weight.

In this case, it is believed that the major factor in the production of abdominal pain and accumulation of gas is the occurrence at intervals of inflammation in the duodenal diverticulum, a diverticulitis. The colonic stasis may be regarded as a secondary or contributory factor.

Case II. White male, aged thirty-four years. Occupation, travelling sales manager. Admitted to Wise Clinic, Americus, Georgia, service of B. T. Wise, February 15, 1928.

Chief Complaint. Attacks of acute indigestion, gas and belching, constipation.

Family History. Father died with diabetes.

Past History. Used alcohol to excess up to eight years previous to admission.

Operations: Hemorrhoidectomy, 1927.

Present Illness. Eighteen months previous to admission, patient suffered attack of nausea, vomiting, and gastric pain after meal of fried potatoes. Pain was partially relieved by soda.

Later, suffered similar attacks two or three months apart. In June, 1927, attacks became more frequent, but were relieved by soda and laxatives. Patient voluntarily states that so long as he kept his bowels well opened, he experienced no trouble.

For six weeks prior to admission, he has been in bed on ulcer treatment following establishment of diagnosis of duodenal ulcer by roentgenography in another clinic.

There has been a loss of 30 lbs. in weight during the last eighteen months.

Physical Examination: Slender, well developed, but poorly nourished male. Teeth, irregular and in poor conditions. Boggy colon, tenderness over cecum on deep pressure.

FIG. 4. Case II. Diverticulum just beyond bulb. Prone position. Note apparent dilatation of duodenal loop, which was transient under screen observation in erect position.

FIG. 5. Case II. Oblique view of diverticulum seen in Figure 4.

Gastric analysis: Normal total, free and combined acids.

Urinalysis: two plus indicanuria, one plus pus.

Blood: R.B.C. 4,500,000; W.B.C. 6000, P.M.N. 68 per cent.

Wassermann, reaction negative.

Roentgenological examination revealed the following: Heart, aorta and diaphragm normal. Esophagus, normal, no cardiospasm.

Stomach ptosed, but tone good; no evidence of lesion of gastric wall. Duodenal cap fills normally in prone position and can be filled in erect position by massage. Under screen and on serial films, there is visualized a duodenal pocket, in first portion just beyond bulb. This is seen to fill and empty from the duodenum, persists under massage, and persists after giving atropine sulphate to full physiological effect. Duodenal peristalsis is seen to pass along the wall of the pocket and in one of a series of consecutive films it is well emptied. No evidence of duodenal ileus.

At five hours the duodenal pocket remains filled, advance of meal along tract is normal. Stomach empty.

At twenty-four hours, the colon is ptosed and filled from cecum to sigmoid. Appendix not visualized, and there is no coecal tenderness.

FIG. 6. Case II. Retention of barium in diverticulum at six hours.

At forty-eight hours, the colon is practically empty, except for small amount of cecal stasis.

Gastro-enteroptosis, mild colonic stasis.

Diverticulum of first portion of duodenum, just beyond bulb. (Figs. 4, 5, 6.)

The patient was put to bed on liquid diet, lacto-dextrin, turpentine stupes, enemas, and belladonna. Later put on soft diet. Improvement in abdominal pain and gas was marked, coincidental with improvement in elimination. In two weeks, full diet was resumed. At this time there was a gain in weight of 3½ lbs., appetite returned, and upper abdominal pain was negligible.

At the present writing, May 26, 1928, patient has resumed work on a liberal diet. Takes mineral oil for relief of constipation. He experiences little abdominal pain, the amount of gas is greatly diminished and there are no symptoms referable to duodenal ulcer. He has gained about 12 lbs. in weight, and has no complaints except for slight amount of gas.

It is believed that in this case, the symptoms exhibited are primarily colonic in origin, and that the significance of the duodenal diverticulum in the causation of symptoms is slight. Operation was not advised, and is not to be advised unless there should occur acute symptoms of duodenal ulceration, in which case the duodenum should be explored and the diverticulum removed.

SUMMARY

1. In cases presenting symptoms of upper abdominal pathology, the possible existence of a diverticulum of the duodenum should be kept in mind in making a diagnosis.

2. Roentgenological examination of the gastrointestinal tract furnishes the means of making a diagnosis of duodenal diverticulum. Careful fluoroscopic observations and oblique visualization of the duodenal loop are essential procedures in this examination.

3. If a diverticulum is demonstrated, there should be a careful correlation of the history, physical, laboratory, and roentgenological findings in order to evaluate properly the rôle of the diverticulum in the production of symptoms.

4. A conservative attitude towards employment of surgical measures should be adopted. Medical treatment of contributory conditions will often relieve symptoms which might hastily be assigned to the diverticulum. If after carefully eliminating other factors, the diverticulum seems reasonably to be the root of evil, surgery is to be advised.

5. Two cases are reported, one in which the diverticulum is considered to be the cause of symptoms, and one in which symptoms are attributed to other factors.

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NEW INSTRUMENTS

A NEW IRRIGATING URETERAL BOUGIE*

A. RAVICH, M.D., F.A.C.S., BROOKLYN

CERTAIN drawbacks and shortcomings associated with the ureteral bulb bougies now in general use, will be overcome, it is hoped, by the one presented herewith. The author's set is composed of five acorn-shaped, flattened metal bulbs, ranging in even sizes from 10F. to 18F. and tapering to a small, blunt olive tip. On the shoulders of the acorn there are two perforations which communicate with the channel of a 7F. roentgen-ray calibrated catheter, to the end of which the bulb is securely attached by means of a connecting screw. The latter is so arranged inside the bulb, and the metal collar is so short, that the catheter retains the flexibility so essential for use in close-vision convex cystoscopes of small caliber, such as the author's new improved cystoscope. A roentgen-ray type of catheter has been selected on account of its durability and usefulness in connection with the roentgenological study of the urinary tract. Whereas the long, rigid bulb and shank of several of the ureteral bougies now on the market make their use impossible in some cystoscopes, the newly devised bulb permits the easy passage of a size 18F. through a 21F. cystoscope if passed ahead of the telescope. The advantages of this new set are:

1. The small, blunt tip facilitates introduction of a large bulb through a small ureteral orifice or stricture, and beyond a calculus. 2. By means of the relatively large elbow protruding to either side of the small ureteral catheter, ureteral obstructions can be determined and accurately localized, and the withdrawal of calculi from the ureter facilitated. 3. The two small holes in the bulb make it possible to use the bougie as a catheter, and with the bulb plugging the lower end of the ureter, ureterograms can be readily made without fear of leakage into the bladder.

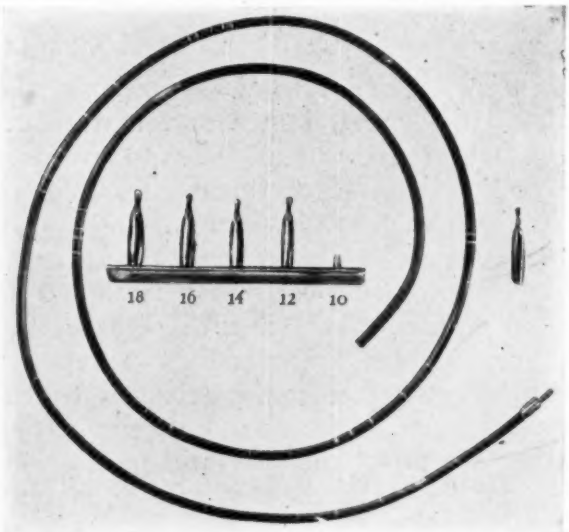

FIG. 1. Author's irrigating ureteral bougies showing holes on the shoulders of the bulbs which range in sizes 10F. to 18F., and the 7F. roentgen-ray catheter with its connecting screw.

FIG. 2. Pyelo-ureterogram with author's 18F. ureteral bougie plugging the lower end of ureter. Immediately afterwards the same bougie was used to dilate the stricture and evacuate the sodium iodide solution.

* Read before Section of Genito-Urinary Surgery, New York Academy of Medicine, March 21, 1928.

A NEW IMPROVED CYSTOSCOPE*

A. RAVICH, M.D., F.A.C.S.

BROOKLYN

THE Buerger cystoscope has not been improved materially in the past twenty years and it is on this type of instrument that the cystoscope herewith presented is fundamentally based. An earlier model of this instrument was presented by the author at the Baltimore meeting of the American Urological Association in May, 1927. The various additions and improvements brought forth in the latest improved cystoscope have been devised to fill in the shortcomings of the older instruments.

Frequently unnecessary meatotomies had been performed on male patients, causing apprehension and nervousness whenever an electrode or catheter larger than No. 6F. was used, because no cystoscope smaller than No. 24F. had been devised to accommodate catheters of larger caliber. Considering the horror that so many patients have for repeated cystoscopical examinations, it is often necessary to do a complete examination of the bladder, kidneys, ureters, vesical neck and urethra at one sitting. For this purpose the cystoscope here described has been designed.

The standard No. 24F. instrument is often too large for the average male patient and so the present model is constructed in size No. 21F., and is therefore considerably more comfortable and tolerable. The curve of the beak has been improved to facilitate its introduction. In order to be able to work at close range in the bladder and to inspect thoroughly and treat the vesical neck and urethra, the lamp, lens and fenestrum are placed on the convex side of the sheath. To obtain a more brilliant picture of the bladder and urethra at distant as well as at close range, the lamp is placed close to the lens.

Since many patients, especially those with intolerant bladders, are irritated by the sudden emptying of the bladder upon withdrawal of the ordinary type obturator and the insertion of the observation lens, a small hump is placed on the back of the bladder end of the telescope, which acts as an obturator and so entirely eliminates this hitherto essential part. To make it smooth for introduction, the hump is elevated into the fenestrum by riding up an inclined plane (first suggested by Dourmashkin and modified by us). If the urine is clear, by using this as the fluid medium a thorough inspection of the bladder can be made by merely turning the obturating telescope 180°. In the meantime the lens is kept from being smeared by secretions and lubricant and is clean when it is presented into the fenestra of the sheath.

After a thorough examination of the interior of the bladder, ureteral orifices and vesical neck has been made, this large and very clear lens system is removed and in its stead is placed a much smaller telescope to which an elevator is attached. Whereas the magnification of the larger lens is about three diameters at a focal distance of 1 in., that of the smaller lens, though also very clear, is of actual size. The catheter fin was eliminated in the original model because of the space it occupied. Yielding to the objection of several urologists, however, an improved removable fin has been added to the equipment for those who consider this necessary. It is higher than the old fin and has two prongs which fit into open slots on either side of the telescope. This prevents the to-and-fro motion that was so annoying and objectionable in the old type of fin. A slightly shorter elevator has been placed on the smaller telescope to minimize the strain upon the lens system. If large bulbed instruments are passed in advance of the telescope, they can readily pass through the fenestra up along the modified inclined plane without being caught as they were in the older type of operating cystoscope.

* Read before Section of Genito-Urinary Surgery, New York Academy of Medicine, March 21, 1928.

With a little care, wax-bulbed catheters can be passed through this instrument without fear of being scratched.

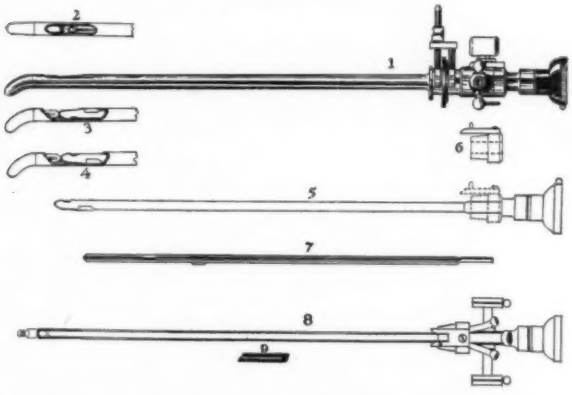

FIG. 1. Improved cystoscope showing: (1) Instrument assembled for introduction with obturating hump filling in the fenestra; (2) large lens close to lamp; (3) relative position of obturating hump and lens as used for introduction; (4) position of lens when telescope is turned 180°; (5) examining and obturating telescope showing knob on ocular end corresponding to position of lens and obturating hump; (6) collar and lock in which obturating telescope rotates; (7) new improved catheter fin with prongs which fit into small slots on either side of (8) small telescope for operating, catheterization and urethroscopy; (9) cross section of small telescope.

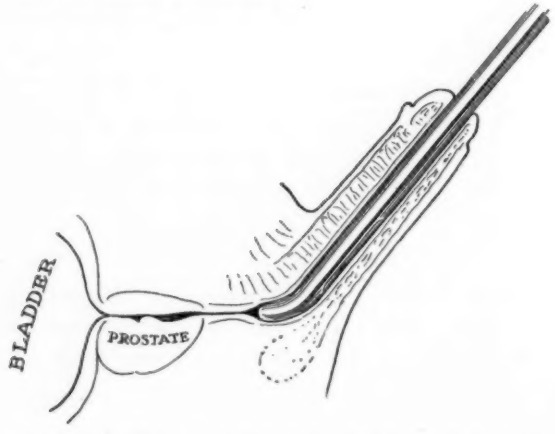

FIG. 2. Urethra showing introduction of improved cystoscope, using obturating telescope.

One large middle channel and two smaller catheter channels are placed at the distal end of the instrument as in the older cystoscopes. Whereas a No. 11F. catheter or instrument is the largest size that can be accommodated in a No. 24F. Buerger operating cystoscope, and a No. 7F. and No. 6F. catheter in the double catheterizing instrument, a No. 7F. and No. 8F. catheter can be passed simultaneously through the two side channels of the author's cystoscope, and a No. 10F. catheter or instrument can be passed through the middle channel. With the fin attached, two No. 7F.

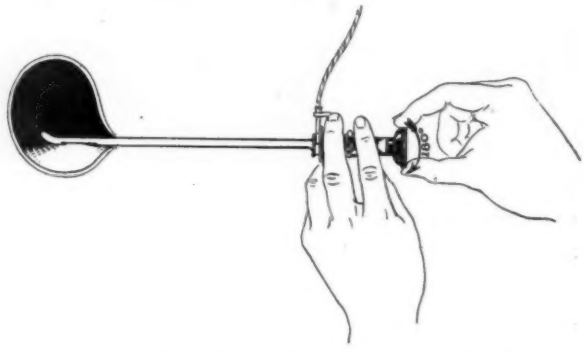

FIG. 3. Instrument having been introduced, freely moving telescope need be given only a 180° turn to establish full vision.

catheters readily pass. As far as metal bulbs are concerned, a No. 18F. Buerger bulb and a No. 18F. Ravich irrigating dilator can readily be passed ahead of the telescope. Very rapid irrigation can be accomplished through the large petcocks attached to the instrument. In view of the improved relative position of the lamp and lens,

FIG. 4. Section of improved cystoscope showing large No. 18F. Ravich irrigating bougie passing through sheath of cystoscope and up along inclined plane below lamp.

the vesical neck and urethra can be inspected with the use of the small telescope and treated much more efficiently than through the older type of operating cystoscope and urethroscope.

A new, improved cystoscope is accordingly presented which is truly a universal catheterizing, examining and operating cysto-urethroscope, and though much smaller in size than the older type of cystoscope, can accommodate approximately the same and in some instances larger size operating and catheterizing instruments. In addition, the one sheath used in this model does all that the concave and convex sheaths had previously done, with greater simplicity and illumination.

A NEW LITHOTRIPTOSCOPE*

A. RAVICH, M.D., F.A.C.S.

BROOKLYN

FOR the sake of brevity and universal usage one compound name might be coined which would be descriptive of the three distinct functions which this new instrument is designed to perform. The Germans use the word lithotriptor instead of the English lithotrite, and lithotripsy in place of the term litholapaxy. Lithotripsy or litholapaxy designates the operation of crushing the bladder stone and irrigating and aspirating the fragments out of the bladder through metal catheters. One instrument, therefore, which does all this under full vision at all times can be properly called a "lithotriptoscope" and this is the name by which the instrument under discussion will hereafter be called.

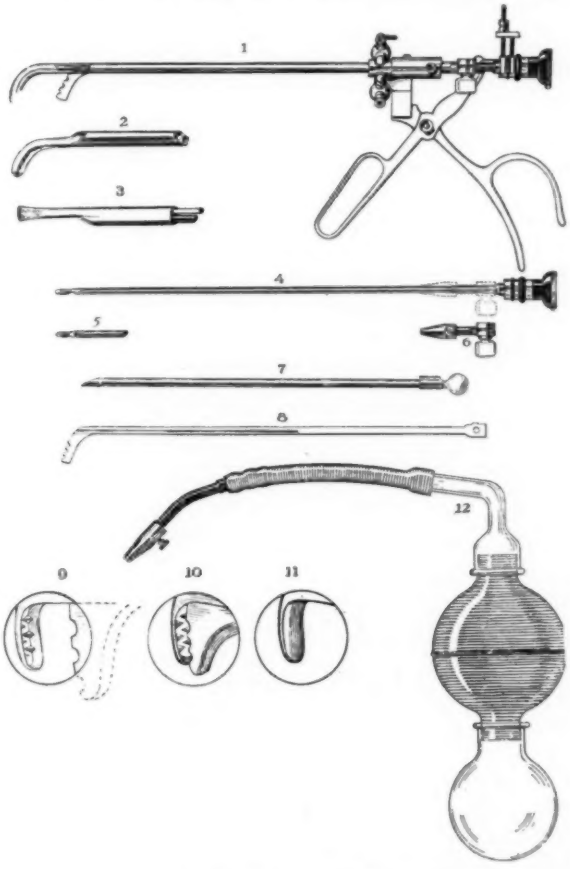

FIG. 1. Author's Lithotriptoscope showing: (1) Instrument assembled with telescope in place; (2) sectional side view of proximal end of irrigating tube and female blade of lithotrite; (3) sectional superior view of proximal end of instrument with obturator in place; (4) McCarthy fore oblique telescope with extra large lamp; (5) dotted lines showing position of adapter; (6) and (7) the obturator; (8) the male portion of the lithotrite which retains its full strength; (9) view obtained when jaws of lithotrite are opened wide; (10) when jaws are partially opened; (11) when jaws are closed; (12) Young's evacuator attached to metal adapter which fits into hollow tube after telescope is removed.

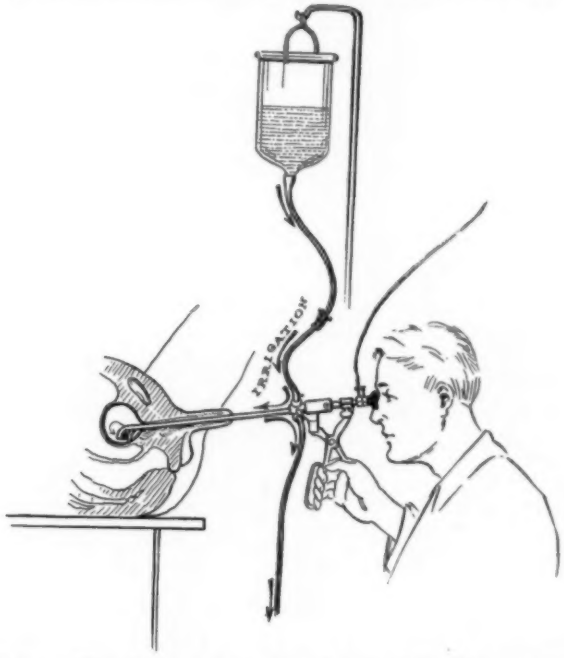

FIG. 2. Showing operator grasping and crushing stone under constant vision kept continuously clear by irrigation.

There have been a number of similar instruments on the market from time to time, the first devised by Hugh Young about twenty years ago. There are also those of Ryall of England and Eugene Joseph and others of Germany. The defects generally found in these modified lithotrites are: (1) The caliber is often too large, Young's being size No. 30F.; (2) the bladder cannot be kept irrigated and clean during the inspection and search for calculi

* Read before Section of Genito-Urinary Surgery, New York Academy of Medicine, March 21, 1928.

unless the examining telescope is removed; (3) the lithotrite is generally weakened by the addition of the cystoscopic attachment; (4) the failure of the right angle visual system when combined with a lithotrite to get a good perspective view of the bladder, calculi and jaws of the instrument; (5) prolongation and awkwardness of operation with the screw control on the lithotrite; (6) the Young and Lowsley foreign body cystoscopes have many merits but can be used only for small calculi and are not strong enough for the crushing of stones.

All these shortcomings and drawbacks are eliminated in the present lithotriptoscope. The caliber is approximately No. 26F. and is oval on cross section. The bladder and fluid medium can be kept clear by continuous irrigation without removing the telescope. The lithotrite and the telescope can be rotated independently of each other, thus facilitating the location of the calculi. A thorough inspection of the entire bladder can be made satisfactorily at the same time. When the stone is grasped it can be crushed very quickly with the pistol handle which replaces the screw arrangement found on all the other models of lithotrites and cystoscopical lithotrites. If there be any clogging of the jaws by the calculus detritus, this can readily be freed by rapid manipulation of the handle combined with irrigation. The lens is the well-known McCarthy fore oblique type equipped with an extra large lamp for better illumination. The instrument is introduced like any ordinary lithotrite with the bladder end of the cystoscopical and irrigating section made smooth by an obturator. As soon as the instrument is passed into the bladder, the obturator is removed and the telescope is pushed into place. It is wise in this connection to arrange the telescope beforehand so as to include the entire length of both jaws in the field of vision.

This relationship can then be maintained by means of set screws that are attached. After the stone is thoroughly crushed and pulverized the telescope is removed and replaced by a bent conical metal tube connected to a Young evacuator, by means of which the fragments can be quickly evacuated. Before the removal of the lithotriptoscope a thorough inspection of the bladder is again made and if there be some fragments left, the operation can be repeated without removing the instrument.

The apparatus is very simple; it is an ordinary Bigelow lithotrite with the screw arrangement cut off and replaced by the pistol handle. Along the side of this lithotrite is firmly attached a hollow tube which admits the obturator or the McCarthy fore oblique telescope. Large petcocks are attached to the outer end of this tube for rapid irrigation. The full strength of the ordinary lithotrite (originally designed by Bigelow and never as yet improved upon), is retained in its entirety. The total caliber of the instrument is No. 26F. and though oval, it is quite tolerable to the ordinary patient. The instrument can be taken apart for purposes of cleaning and sterilization. Of course, the telescope is the only part that cannot be boiled.

A CYSTOSCOPIC LITHOTRITE AND RONGEUR OR FOREIGN BODY EXTRACTOR*

J. J. VALENTINE, M.D.

NEW YORK

IN presenting this instrument, no credit for originality is desired. It is simply a modification of the original Nitze cystoscopic lithotrite and rongeur which served our purpose, even if under trying conditions, before a modern lens system and irrigating facilities were given us.

We have had many true cystoscopic lithotrites submitted to us and the chief criticism against the rongeur that we have been using has been the weakness of the blades (which bent when attempting to crush a rather hard stone) and the inability to use continuous irrigation through them.

No change has been made in the original Nitze lithotrite as regards the crushing mechanism. The jaws seem to be unusually strong and the steel used in the German manufacture seems to have stood the test, since this instrument is many years old. The fenestrated distal jaw permits one to view the calculus through it and when the object is grasped it is under vision at all times.

The only radical change suggested was to furnish us with a modern telescope and facilities for continuous irrigation, which is required for most intravesical manipulations. This was done and no difficulty has been encountered in its use during the past three months.

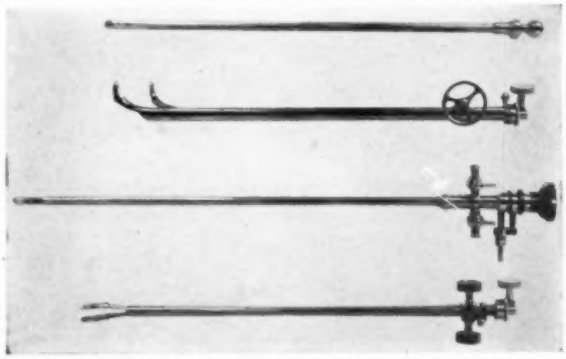

FIG. 1.

The sheath which is intended as a rongeur or foreign body extractor may be used with the same telescope as for the lithotrite, to which has been attached the irrigating system.

Again, the ingenuity of Mr. Rhinold Wappler has demonstrated itself and to him is due the credit of making this instrument of practical value.

* Read before Section of Genito-Urinary Surgery, New York Academy of Medicine, March 21, 1928.

A SIMPLE AMBULATORY FOOT SPLINT*

CARL R. KEPPLER, M.D.

NEWARK, N. J.

IN those cases of infantile paralysis in which the quadriceps and other thigh muscles are paralyzed, whether partially or entirely, and with paralytic flail foot, the usual braces employed to aid locomotion are made to include foot, leg, knee and thigh. These braces may be made with or without joint and drop ring fixation at the knee joint. This is done to prevent the sudden bending of the weak knee under the strain of body weight and the consequent damage to the limb. The joint at the ankle is either limited in motion or completely stopped in one or the other direction of angle flexion and extension.

With its two bars, connecting steel crosspieces behind the thigh and the calf, and foot-plate below the sole, and, added to all this, the straps and buckles and leather knee cap, these braces are, to say the least, cumbersome, and, for young women, quite disfiguring. The writer, in view of this, endeavored to find a proper, sufficient and safe splint which would in every way take the place of the one just described, universally known as a leg and thigh brace.

It is a fact that the position of right angle immobilization of the ankle will practically completely prevent any flexion of the knee joint as long as weight is borne upon the leg and foot. If, therefore, something could be formed to cause this complete fixation of the lower leg and foot from immediately below the knee joint to the base of the toes, the position of over-extension of the knee, by reason of the backward pull of the two heads of the gastrocnemius muscle upon the condyles of the femur, must of itself be retained. I, therefore, struck upon the plan of making a mould of the leg and foot and over this to have shaped, with a rather thick piece of aluminum or forged steel sheeting, a posterior one-piece splint, the calf band of which encircles the leg about two-thirds of its circumference. The upright runs down immediately behind the heel and is narrowed sufficiently behind the ankle to fit the ordinary shoe. This continues as a metatarsal foot plate to the base of the toes with a thin lacing and ankle strap to hold the foot upon it. Lacings of broad-webbed straps hold the calf band in place. The entire splint on its inner surface (that

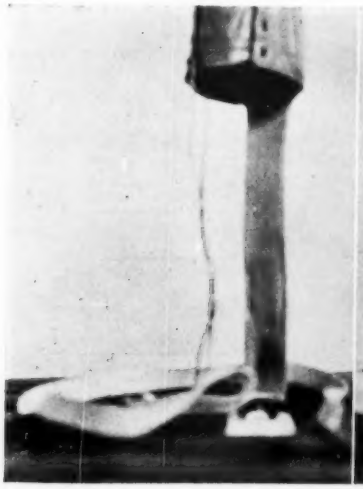

FIG. 1. Anterior view.

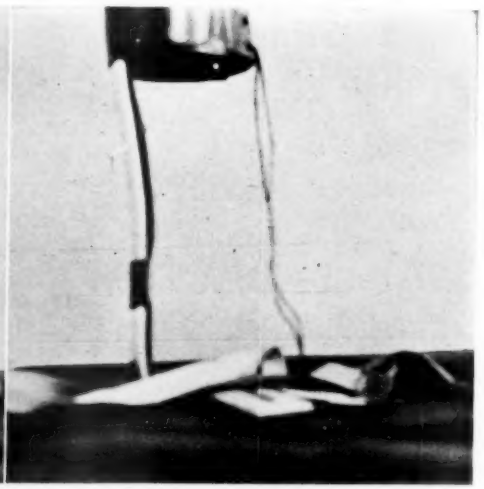

FIG. 2. Lateral view.

* Submitted for publication, May 19, 1928.

which comes in contact with the leg and foot) is well padded with felt and leather. The patients wear a very low-heeled shoe to maintain the right angle position. When they stand up, with the brace applied and covered with this shoe, the main body weight falls on the heel part of the splint and foot. This causes a backward pull upon the leg and calf band, thus throwing the knee into a secure and comfortable over-extended attitude. An added advantage of the splint is that when the patient walks, he finds that on ending the step, he can swing the foot and leg forward by bending the knee, instead of swinging the entire stiffened member outward and forward, as is the case with the leg and thigh brace. The fact of the lightness of the splint is another great factor in making the ease of locomotion with it so much greater than with the old, rather heavy, leg brace.

The writer used this splint for about one year, in practically every case of infantile paralysis where previously the regular leg and thigh brace had been used. In every case its application was successful and satisfactory and every one has been worn with comfort and increasingly good gait. A further factor to consider is the natural increase in strength, development of the leg and thigh, due to the greatly lessened brace restraint and constriction, and the markedly increased activity of the limb through the bending and overstretching of the knee joint in walking.

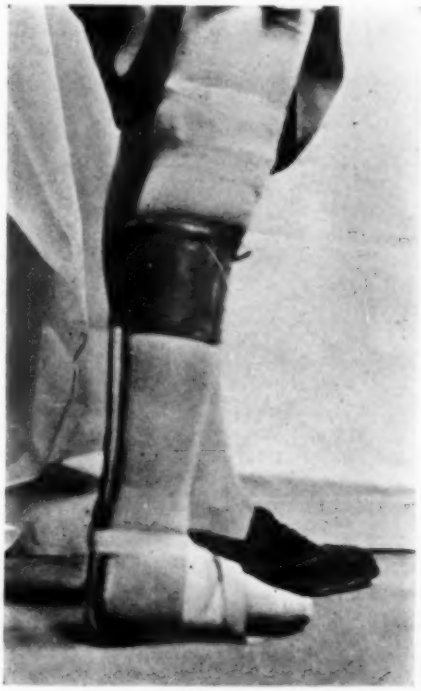

Fig. 3. Brace applied.

A CLUB-FOOT BRACE*

CARL R. KEPPLER, M.D.

NEWARK, N. J.

NO matter what primary corrective procedure has been undertaken, it is a well known fact that the correction of club feet must be carried out for a long period of time to prevent recession and a new beginning. The writer assumes the privilege of calling this the supportive period of treatment of club feet and as an aid to this supportive period of after treatment, he has worked out a simple corrective brace, which he has found very effective and satisfactory. It is intended more for recumbent and night use in connection with the use of the regular ambulatory retention club braces or splints. The appliance includes both feet, thus adding to stability and corrective force, and preventing injurious bruising of one or the other limb during sleep. The brace is made in the following manner:

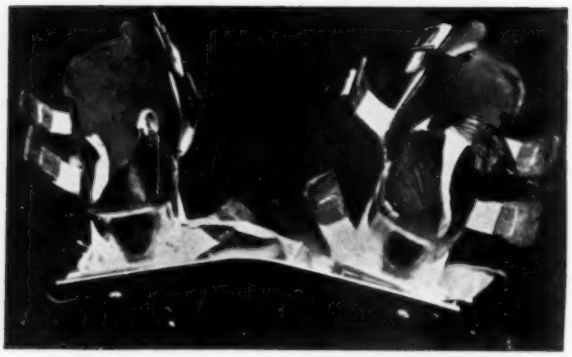

FIG. 1. The club-foot brace.

To a jointed cross bar of No. 18 machine steel about 8 inches long and 2 inches wide, two metal padded foot pieces, similar to the shape of those of the Taylor club foot brace and of a size to fit the feet of the child are fastened near each end by their heel boxes. This attachment is not a fixed one but is made in the form of a rotating joint so as to allow inward and outward turning of each foot piece upon the cross bar. From the sole of each sandal there projects at right angles to it and at its heel base, a circular metal flange about 1 inch in diameter which lies flat against the cross bar. This flange is sufficiently slotted to permit much more than normal inward and outward rotation of the foot piece and a winged thumb-screw is fastened into the cross bar through this slot. By tightening down the screw upon the flange one can thus firmly fix the foot piece in any desired position of inward or outward rotation. The material of the cross piece is furthermore such as to permit bending. By gradual stages one can, therefore, add also to the corrective outward rotation the necessary eversion of the feet. By turning the foot pieces inward as far as is necessary, the club feet of the child are easily placed into them and are then firmly fixed by means of the straps. Thereupon the necessary overcorrection is produced and maintained by means of the thumb screws. To make the retention of the feet in the sandals quite secure, I have added to the usual straps leather ankle cuffs with four tapes. These tapes pass through slots in the sole of the foot piece and are tied under them.

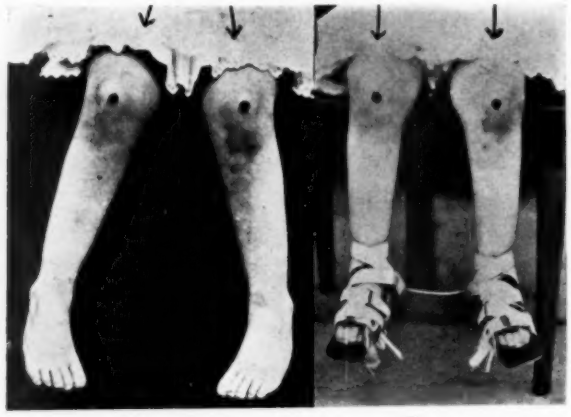

FIG. 2. FIG. 3.

FIGS. 2 and 3. Brace applied, correcting inversion as well as club foot.

The advantages of the apparatus are: (1) simplicity, (2) ease of application, (3) absence of discomfort, (4) very marked corrective force, (5) usefulness in both single and double club foot.

* Submitted for publication, May 19, 1928.

APPARATUS FOR THE REDUCTION OF FRACTURE DISLOCATIONS OF THE CERVICAL SPINE*

JOSEPH E. J. KING, M.S., M.D.

NEW YORK

IT has been demonstrated and proved by Dr. Alfred Taylor that fracture dislocation of the neck can be actually and immediately reduced. For this method of reduction a Hawley table, a halter and a belt are required. With the patient in the prone position and the halter applied, a surcingle or belt attached to the halter passes about the operator. The operator makes traction by backing away from the patient, and by manipulation the reduction is accomplished. Following the reduction a plaster of Paris cast is applied to maintain position. In order to accomplish this reduction more steadily, so as to eliminate the possibility of slipping or other mishap, and also to do away with the plaster of Paris cast which reaches high up under the chin, I have devised the apparatus presented.

To review the bony pathology briefly, a fracture dislocation of any cervical vertebra may occur, but it is most usually the fifth forward on the sixth, or the fourth forward on the fifth. The articular process of the upper vertebra is anterior to that of the lower, which prevents the dislocation from being readily reduced by manipulation alone. Therefore, in order to accomplish a reduction, it is necessary to make traction upward and forward, and when the articular processes have been disengaged, reduction can be accomplished.

PROCEDURE

With the patient in a sitting position, a plaster cast is applied around the chest and abdomen and over the shoulders, all parts being well padded with sheet wadding. The apparatus is then placed over the wet plaster cast and is incorporated in it. This fixes the apparatus to the patient. The halter is then applied and tightened up beneath the chin and occiput. With the two upright pieces thrown forward, traction is made by turning the handle on the end of the transverse bar to which the halter is attached by strong straps. The degree of traction is safeguarded by a rachet so that any degree of traction desired can be obtained and maintained. Traction is made forward and upward while manipulation of the neck is done by the operator. When the articular processes have become disengaged, the upright pieces, which maintain constant traction, are brought backward, lifting the upper vertebra into position over the lower one. The backward position of the upright pieces maintains traction in extension, the position desired.

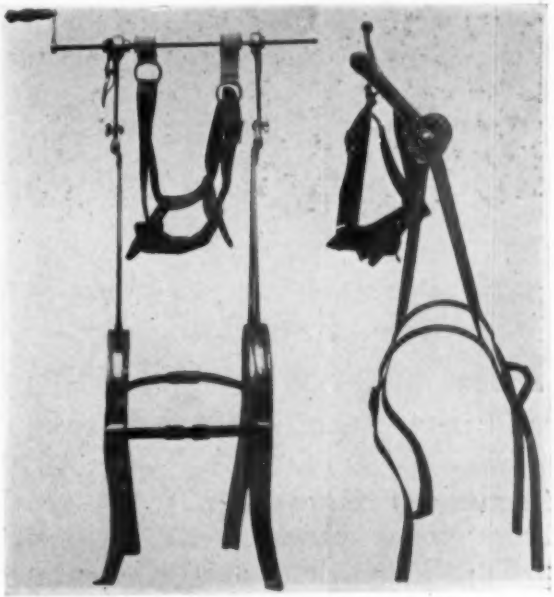

FIG. 1. FIG. 2.

The patient wears this apparatus for about six to eight weeks, after which time it is removed and a Thomas collar applied.

The advantages of the apparatus are the simplicity in its application and the absolute maintenance of position.

* Read before Section of Orthopedic Surgery, New York Academy of Medicine, April 20, 1928.

A NEW SPLINT FOR FINGER TIP FRACTURES*

JOHN D. ELLIS, M.D., CHICAGO

THE indications for treatment of fractures of the distal finger phalanges are different from those existing in fractures of the other phalanges. In the latter group, traction as well as immobilization is quite frequently or perhaps routinely necessary.[1] In tip fractures, however, after the dangers of necrosis of fragments, resulting hemorrhage into the theca and of osteomyelitis in compound cases have been apprehended, it is often thought necessary only to apply a lateral splint or a protective cap made of crossed strips of aluminum and wait for healing.

FIG. 1. Splint in position, without felt pad or complete strapping.

Fractures of the distal phalanges are notably slow to elaborate firm callus and the tip remains quite tender for several weeks. This tender immobilized finger renders the hand temporarily useless. To make the hand industrially effective we must splint the finger so as to render the tip non-tender. Any ordinary splint covering the injured tip presses down upon the tender end whenever the finger is used. Furthermore with one finger splinted in extension, an effective flexion such as is exercised in grasping the handle of a tool is prevented.

FIG. 2. Splint in position.

The discrepancy between his wages and the weekly compensation paid the workman under the provision of workmen's compensation acts is very considerable, particularly in such semi-skilled occupations as those in the building trades where the wages are now very high. On any large building operation or construction job, the foreman can often employ two or three fractured finger cases if the finger can be rendered non-tender so the hand can be used in grasping and in rough work.

To meet these industrial indications for a non-tender flexed finger, we have found serviceable a modification of a finger splint consisting of a bent aluminum trough for the flexor surface of the finger, the distal end curving around to fit over the tip of the finger. The shaft of the splint extends down into the palm. To this shaft we have added a perforated padded aluminum flange which presses against the thenar eminence when the tip of the finger is struck. This flange is strapped against the hand and is further strapped with adhesive holding it firmly in place. The shaft of the splint can be easily rivetted in a position on the flange to correspond to any finger, with a small punch and an aluminum rivet.

[1] Mock, H. E., and Ellis, J. D. Treatment of fractures of fingers and metacarpals, with description of authors' finger calipers. *Surg., Gynec. & Obst.*, 45: 551, 1927.

* Submitted for publication, June 9, 1928.

CASE REPORTS

MASSIVE COLLAPSE OF LUNG AND RÉSUMÉ OF EIGHT CASES*

CHARLES L. GIBSON, M.D.

NEW YORK

M. F. male, aged twenty-one; admitted January 13, 1928; discharged January, 24, 1928. Long standing history of recurrent attacks of appendicitis. Operation, January 14, for subsiding appendicitis.

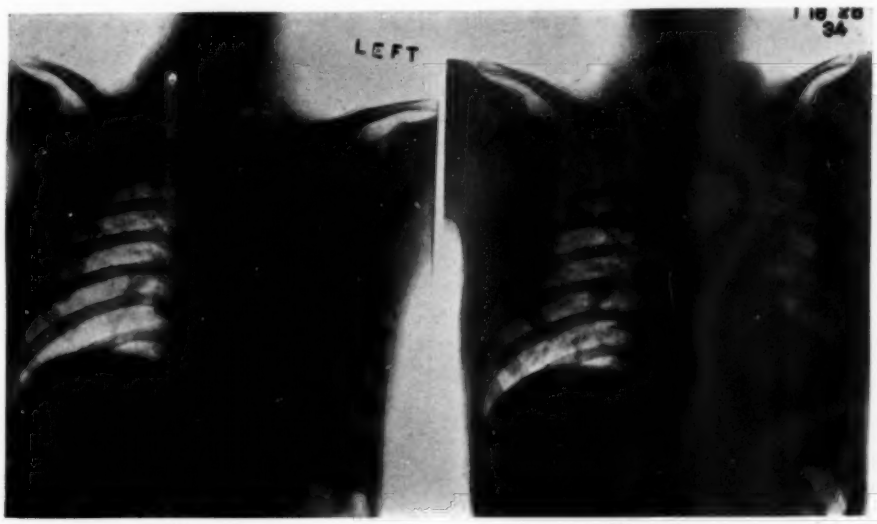

FIG. 1a. FIG. 1b.

Subsequent Course. Cough, temperature and increased respirations on night following operation. Massive collapse manifestations. Diagnosis confirmed by roentgen ray on second postoperative day: The examination of the thorax shows marked opacity of the entire chest and quite marked deviation of the trachea, heart and mediastinum to the left side. The findings indicate a massive collapse (Fig. 1a).

The House Surgeon placed the patient on his right side, and slapped the left chest. He became very cyanotic, gagged and coughed up a large "gob" of mucus. He began to improve immediately. Roentgen ray taken thirty minutes later showed: A very definite clearing of the shadow of the left lung, indicating that the lung was then aerated. The trachea had returned almost to midline. The cardiac shadow was still displaced to the left, indicating that the mucous plug had probably been released and the massive atelectasis relieved (Fig. 1b).

Roentgen ray taken on third postoperative day: The examination of the thorax showed the mottled increase in the density in the left lung still present. The cardiac shadow was still displaced somewhat to the left; but the trachea was almost in its normal position, indicating that the massive collapse had not returned (Fig. 2).

Condition cleared up rapidly and patient left the hospital in good condition on the tenth postoperative day (Fig. 3).

SUMMARY OF EIGHT MASSIVE COLLAPSE CASES

CASE 1. G. R., female, aged seventeen. Operation, January 7, 1926. Appendectomy for

* From the first (Cornell) Surgical Division, New York Hospital. Read before Section of Surgery, New York Academy of Medicine, March 2, 1928.

chronic appendicitis. First symptoms of massive collapse second postoperative day (right). Duration of collapse about thirteen days.

Fig. 2.

Case II. E. G., male, aged eighteen. Appendectomy for acute appendicitis with drainage July 3, 1925. Signs of massive collapse first postoperative day (left). Duration of collapse over nineteen days.

Case III. F. B., female, aged twenty-six. Cholecystectomy and drainage October 7, 1925. First symptoms of massive collapse second postoperative day (right). Duration of collapse five or six days.

Case IV. P. S., male, aged fifteen. Appendectomy for acute appendicitis (large, gangrenous appendix), no drainage, December 29, 1927. First symptoms of massive collapse third postoperative day (left). Duration of collapse six or seven days.

Case V. J. C., male, aged twenty-five. Operation for chronic appendicitis and partial intestinal obstruction by bands, December 6, 1927. First symptoms of massive collapse night following operation (right). Duration of collapse about twelve days.

Case VI. M. F., male, aged twenty-one. Operation for chronic appendicitis January 14, 1928. First symptoms of massive collapse night following operation (left). Duration of collapse four or five days.

Case VII. J. C. (Same as Case V.) Gastroenterostomy for relief of duodenal obstruction by diffuse bands, February 1, 1928. It did not seem feasible to treat this case again by division of the bands. First symptoms of collapse night

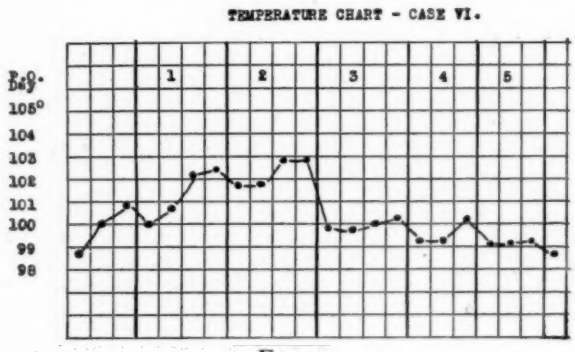

Fig. 3.

after operation. (Right, same side as before.) As there was considerable oozing from the wound it was reopened for exploration, with possibility of intraperitoneal hemorrhage. This was not found to be present. Duration of collapse about twelve days.

Case VIII. J. R., male, aged twenty-six. Appendectomy for acute appendicitis, no drainage, February 20, 1928. First symptoms of massive collapse on first postoperative day. Duration of collapse about four or five days.

DISCUSSION

Dr. Willy Meyer. Recently, at the joint meeting of the Philadelphia Academy of Surgery and the New York Surgical Society, Dr. Lee of Philadelphia gave an excellent presentation of this condition. Several years ago when a case of massive collapse of the lung with the chest closed, was presented before the Congress of Surgeons in Montreal, it was difficult to understand it. There was doubt in our mind that it was a massive collapse in the usual sense of the word. Dr. Lee called it in his presentation massive atelectasis, which brought it nearer to ordinary understanding.

He showed what had been accomplished with the assistance of bronchoscopy. The pathology was easily cleared up. They found the respective bronchus filled with a very viscid mass which blocked the bronchus. After removal by aspiration distention of the pulmonary lobe by the inhaled air took place.

America is leading the world in the development of bronchoscopy for the benefit of thoracic

affections. The thoracic surgeon has no better friend than the pectoral endoscopist. Dr. Lee worked with Dr. Tucker, the associate of Dr. Chevalier Jackson.

Dr. Gibson put his patient on the side and then struck him on the chest with the palm of the hand; after a severe coughing spell the man began to improve. Here strong mechanical irritation cleared the bronchus.

These observations make us understand how massive atelectasis does occur. It evidently can set in after any kind of operation and is, no doubt, often called postoperative pneumonia.

Careful clinical and roentgenographical examination, in most cases, will clear the picture quickly in the future. The high position of the respective half of the diaphragm and the acute emphysema of the opposite lung pressing the mediastinum to the affected side are unmistakable pathognomonic signs. They will be found under otherwise normal conditions because the reduced space within the closed chest produced by the non-distention of the respective pulmonary lobe must be compensated for.

Dr. Howard Lilienthal. I believe there are three kinds of atelectasis; one produced by obstruction of a bronchus; another by direct pressure on a lung; and the third by spasm of the lung itself. Massive collapse shows a denser shadow than pneumonia. With an open chest it is easy to see a traumatic atelectasis with the entire lobe squeezed down to the thickness of the human hand send all the air out of the lung. Atelectasis does not mean airlessness; it means absence of terminal expansion and that is quite a different thing. There is a form of massive collapse in which airlessness is not the principal phenomenon. The lung tries to collapse but is prevented by the negative pressure in the chest, so that fluid and cellular elements fill the alveoli; or a single lobe may truly collapse, the other parts of the lung and also the dislocated mediastinum and elevated diaphragm making up the space.

AN UNUSUALLY LARGE OVARIAN CYST COMPLICATED BY MALIGNANT MALARIA AND ANCYLOSTOMIASIS*

N. Nedergaard, M.D., D.T.M.&H.

BANGKOK, SIAM

THE patient was a Siamese woman aged twenty-seven years. She had one child, five years old, in good health. Three years ago she noticed a tumor in the lower abdomen, which within a few months became very large. She sought many native healers who treated her with drugs and massage. Finally she went to a government doctor who was frank enough to tell her that her only chance was an operation and advised her to go to the mission hospital in Petchaburi. In spite of spirit doctors and well-meaning friends, who made strong efforts to dissuade her, she followed the good advice. Her home was far away in the jungles of South Siam. Her husband was a Durien gardener in excellent health, but not well-to-do. Their money had been spent on healers who failed to heal. They managed to borrow sufficient money to make the long journey, one day by boat or elephant and one day and a night by railroad.

They arrived at the hospital on November 7, 1925. The patient was weak and emaciated, but able to walk. She was dyspneic, pulse 145 and temperature 100.5°F.

November 8, 1925: Temperature 98°F. and pulse 92 in morning; 100.2°F. and 120 in afternoon. Red blood count, 2,608,000; stool, ancylostoma and ascaris; urine, negative; weight, 138 lbs. Weight of tumor estimated at 60 lbs. (which was later found to be much too low an estimate). Tapping was attempted, but contents of tumor was cystic fluid too thick to flow through large size cannula.

November 10, 1925: Hookworm treatment given and blood building started.

November 23, 1925: Red blood count, 2,900,000; stool, ancylostoma and ascaris;

* Submitted for publication, June 28, 1928.

hookworm treatment repeated and blood building continued.

November 25, 1925: About 10 lbs. of watery fluid removed from various peritoneal pockets around the tumor.

Fig. 1. Patient on arrival at hospital, showing posture caused by weight of tumor.

November 28, 1925: For three weeks the patient's general condition improved markedly, the afternoon temperature gradually came down to normal, the appetite was excellent. Measurements: Height, 58 in.; weight, 147 lbs.; girth about upper chest, 33 in.; about tumor, 52 inches; vertical circumference of tumor, 50 in.; diameter of tumor, 15 × 17 in. Red blood count, 3,120,000.

December 1, 1925: Operation had been planned for this day, but in the morning the patient was very drowsy, and had a temperature of 104.5°F. and a pulse rate of 188. This condition continued all day. Blood examination showed a very heavy infection of malignant malaria. Energetic treatment was started immediately.

December 10, 1925: The temperature stayed up to 102°F. and the pulse rate just above 100 the first two days, then both suddenly dropped to normal and remained so during one week. General condition greatly improved. Red blood count, 4,030,000; weight, 140 lbs.

December 17, 1925: During the week the temperature was above 99°F. every afternoon; 101°F. one day. The temperature was considered in part due to increasing pressure of the tumor, as it did not respond to quinine. Operation was decided on, either to remove the tumor, or at least to remove part of the fluid.

Operation. Anesthetic was very easy and light. Abdomen opened about 5 in. Very dense adhesions tied the tumor to the anterior abdominal wall. Cutting into the tumor revealed only very small cysts with but little fluid to a depth of 4 in. Then finally the real cavity was reached and some 20 lbs. of water allowed to escape. It was now possible to explore the situation. The solid tumor occupied the entire right side of the abdomen, extending anteriorly over the entire front of the abdomen and up under the liver and stomach, pushing the organs of the chest several inches upward. The thin-walled cavity containing the water was behind and to the left. All was apparently densely adherent to

Fig. 2. Patient lying down, showing crowding of chest by the tumor mass.

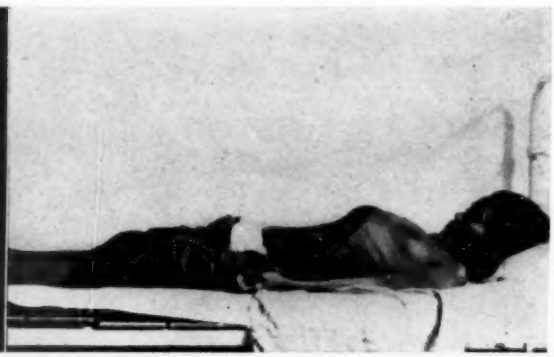

Fig. 3. Just after operation, showing elevation of chest and flaring of ribs.

surrounding structures. The pulse was getting rather weak and removal of the tumor at this time was entirely out of the question. The wound was sutured without drainage.

Following first operation the temperature rose to 101°F., returning to normal on the third day. On the eleventh, twelfth and thirteenth days there was an upward curve to 101.7°F., then the temperature remained entirely normal the following eight days. The pulse ranged between 85 and 125.

January 9, 1926: Tumor gradually reached its former size. Red blood count, 3,380,000.

January 23, 1926: Temperature was 99°F. to 100°F. every afternoon for two weeks; weight, 148 lbs. Paracentesis done through the left loin and the tumor emptied as far as possible.

January 24, 1926: Weight, about twenty-four hours after tapping; 108 lbs. Red blood count, 4,203,000. This high count undoubtedly due to the drainage of a large quantity of blood fluid into the tumor cavity after tapping.

February 15, 1926: Temperature was normal for three weeks. The general condition excellent, and the patient gaining rapidly in flesh and strength. The tumor again reached its former immense proportions.

Feb. 16, 1926: Second operation performed. An incision, 18 in. long, was made in the median line. The tumor was adherent by its entire surface, about ⅓ being very dense adhesions to the abdominal wall anteriorly, and about ⅔ looser hydrocystic adhesions to the abdominal wall, bowels, and the various organs behind and above. The main blood supply was derived from the abdominal wall of the right upper quadrant. The pedicle, at the left ovary, was only the size of a finger and contained no larger blood vessels. There was not very much loss of blood, or oozing, because all vascular strands of adhesions were clamped and cut immediately as encountered, leaving the field of progress free and wide open. Ligating was done after the tumor mass was out of the way. Aside from a slight injury to the liver capsule, there were no accidents. But there was very little normal peritoneum to be found anywhere. A few ounces of liquid petrolatum were poured into the abdominal cavity. The incision was closed by a running suture of catgut through peritoneum and fascia, and another through the skin. Time of operation: Two and a quarter hours. Pulse, before operation, 100; after operation, 140. Anesthesia: Chloroform, entirely satisfactory, narcosis light and smooth.

After the second operation the temperature was 101°F. for two days, then entirely normal for three days. There was no pain and the general condition was excellent. During the following week the temperature stayed steadily at about 100°F. and there was moderate flatulence with 5 to 10 liquid bowel movements each twenty-four hours. At the same time there was rather persistent restlessness and sleeplessness and gradually increasing local tenderness to touch and muscular contraction on the right side high under the margin of the ribs. The pulse was 95 to 105.

Fig. 4. Three weeks after operation, showing normal posture and general well-being.

March 2, 1926: Stool, ancylostoma and ascaris; red blood count, 2,624,000; white blood count, 25,250. Hookworm treatment: Carbon-tetrachloride 20 drops; oe. chenopodium, 8 drops.

March 15, 1926: The diarrhea subsided and the tenderness gradually disappeared. The temperature remained normal in the mornings and 100°F. to 103°F. in the afternoons. Quinine was pushed to toleration and then discontinued because of distressing toxic symptoms. The general condition was very good. Worry about food and money, and decided homesickness appeared to be largely responsible for the afternoon fever. Red blood count, 2,852,000; white blood count, 14,450.

March 16, 1926: Permission given to go home in five days. Hookworm treatment repeated.

March 22, 1926: With homesickness relieved the temperature became normal, and at the end of the promised five days the patient went home happy and well.

We lost track of the patient for nearly two years, then had a letter from the husband saying that they are both well, but still found it hard to return the small sum of money given them for the trip home.

SUMMARY

1. A Siamese woman, less than five feet in height and weighing 148 lbs., was relieved of an ovarian cyst weighing 80 lbs., more than half of the total weight. The tumor was adherent to visceral and parietal peritoneum by almost its entire surface of 2.8 square feet.

2. This woman had severe chronic malignant malaria with one very sudden and severe acute attack three weeks after coming to the hospital.

3. She also had a heavy infestation with both ancylostoma and ascaris, both of which failed to yield to treatment until after the tumor had been removed.

4. Malaria and hookworm had caused anemia with a red blood count 40 per cent below the Siamese normal. Prolonged treatment before operation raised the blood count to nearly normal. The operation caused a drop of about 30 per cent, a drop which would undoubtedly have proved fatal without the preliminary treatment, but now was of no serious consequence.

5. There was a low fever for prolonged periods both before and after operation, which failed to respond to quinine. This was promptly relieved, before operation by relief of pressure, and after operation by relief of worry and homesickness.

6. Two years after leaving hospital patient was living and well.

CASE REPORTS BY DR. E. W. PETERSON*

NEW YORK

MULTIPLE CYSTS OF THE MESENTERY

S. C., male, aged six, of healthy Italian parentage, was admitted to the Babies' Wards, Post-Graduate Hospital, April 28, 1927. At fifteen months of age the boy had had, in the order named, measles, whooping-cough, pneumonia and multiple furuncles, from which he made a good recovery. At four years of age, it was noticed that his abdomen was somewhat larger than normal, but otherwise he seemed perfectly well. Three weeks before admission there developed an acute attack of abdominal pain, with high fever, vomiting and constipation, but the attack subsided after three or four days. No definite diagnosis was made at this time. Upon admission, the examination revealed nothing of interest except an irregular enlargement of the abdomen and an acute right-sided epididymitis. A large, nodular, tense cystic mass, occupying the right side of the abdomen and extending over beyond the median line, could be felt. In the left upper abdomen there was distended tympanitic bowel.

The boy was seen by a number of physicians, connected with the hospital, and the following possible diagnoses were mentioned: Cystic kidney; hydronephosis; echinoccocus cyst; pancreatic cyst; ascites; acute urinary retention, etc. The writer's opinion was that we were dealing with either a polycystic condition of the right kidney or a possible hydronephrotic accumulation. The epididymitis subsided quickly and was never satisfactorily explained.

On May 6, 1927, the abdomen was opened and the tumor mass was found to be a large cyst and two smaller cysts of the mesentery, grouped together and intimately connected with the lower ileum. It could be lifted out of the abdomen easily. An attempt was made to enucleate the cysts from the mesentery but it was found impossible of accomplishment, without sacrificing the blood supply to the bowel. It was necessary to resect about 8 in. of intestine in order to remove the tumors. An end-to-end suture anastomosis of the ileum was performed without difficulty. The patient made a prompt and uninterrupted recovery and was

* Read before Section of Surgery, New York Academy of Medicine, April 6, 1928.

able to leave the hospital two weeks after operation.

The report by Ward J. MacNeal, M.D. follows:

Gross. Appendix was 58 mm. long and 5 to 6 mm. in diameter. On section the lumen extended to the tip and contained formed yellow feces. Second specimen measured 160 × 115 × 80 mm. It included a portion of intestine, apparently the small intestine, 110 mm. long and 10 to 22 mm. in diameter. Intimately attached at one side of this piece of gut there were three cysts; one was 60 mm., another 35 mm. and the other 120 mm. in diameter. These were opened. The wall of the cysts in each case was about 1½ mm. thick.

Microscopical. Sections of the appendix showed scattered dense collections of round cells in the submucous coat. The subserous coat was thickened by edema. Its blood vessels were congested and there was an excess of round cells about them. The reaction in the appendix was, however, not very severe. Sections through the wall of the intestine including the wall of one of the adjacent cysts showed moderate inflammatory reaction in the mucous membrane of the gut and some thickening of the muscular coats. The cyst was lined by granulation tissue in which there were abundant clefts from which lipoid material had been dissolved out. In this granulation tissue there were abundant multinucleated giant cells of the foreign body type. The superficial portion of the lining was necrotic. It was impossible to recognize any elements of intestinal mucous membrane in the lining of the cyst in these sections.

Diagnosis. Subacute appendicitis; multiple cysts of the mesentery intimately attached to the small intestine, of unrecognized origin.

Dr. Nicholas M. Alter was kind enough to examine the specimen too and his report follows: "I have gone over very carefully the case of mesenteric cyst (Lab. No. 20778–30976). The description by Dr. MacNeal fits the microscopical picture accurately. I do not think the cyst is of intestinal origin or derived from the omphalo-enteric duct. I think it should fall in Gould's classification (Group 1), of embryonic cysts of chylous origin. In the lower layer of the cyst wall there are very numerous dilated lymph vessels and chylous cells are seen in many of these cystic dilations."

Cysts of the mesentery are of interest because of their rarity, the indefinite theories as to their origin, the disputed classification and the infrequency of correct diagnosis when they do exist. It has been stated that no case has ever been recognized with certainty before operation or autopsy.

Fig. 1. Multiple cysts of mesentery.

W. B. Swartley, of Philadelphia,[1] has written a most instructive article on mesenteric cysts, with a review of the literature on the subject. He quotes Higgins and Lloyd as considering true mesenteric cysts to be "those which occur in or near the mesentery and which are not malignant, dermoid, or parasitic, and do not arise, in any normally placed retroperitoneal organ." He classifies them as:

A. Cysts of embryonic origin arising from mesodermal remnants incarcerated behind the developing peritoneum and subsequently migrating forward between its layers.

B. Cysts of intestinal origin, (1) arising in most cases as diverticula from the bowel during development and (2) possibly derived, sometimes from persistent portions of the vitelline duct.

The symptoms in the case here presented were those of a partial, chronic intestinal

[1] Swartley, W. B. Mesenteric Cysts. *Ann. Surg.*, 85: 886, 1927.

obstruction, due to narrowing of the overlying intestine. The attack of acute abdominal pain with nausea, vomiting, temperature (103°F.) and constipation, four weeks before operation, might possibly have been due to an attack of appendicitis as this organ showed such definite evidence of disease that it was removed and sent to the laboratory for histological study, along with the cysts.

Intestinal obstruction, either acute or chronic, is the most important and the most frequent complication of cysts of the mesentery. It may be from volvulus, intussusception, kinking and pressure narrowing or occlusion of the overlying intestine.

The most satisfactory plan of treatment is enucleation of the cyst or cysts of the mesentery, if it can be accomplished without damage to the bowel or to the blood supply of the bowel. In our case this could not be done, so an intestinal resection was necessary. Drainage of the cyst is another plan of treatment, but it is apt to be followed by a persistent sinus.

APPENDICITIS COMPLICATIONS

INTESTINAL OBSTRUCTION AND MULTIPLE FECAL FISTULAS FOLLOWING OPERATION FOR APPENDICITIS

L. P., born August 12, 1914, of healthy Italian parents. There were two other children in the family, both healthy. She had had measles and whooping-cough. In August, 1920, she was taken to Broad Street Hospital and operated upon for acute appendicitis. She had a stormy period following operation and on the eighteenth postoperative day she was again operated upon, the original incision reopened and a quantity of pus evacuated. Following this procedure fecal fistulas developed and the wound never healed. The patient was in Broad Street Hospital for three months, then allowed to go home.

On March 2, 1921, when six and one-half years old, she was admitted to the writer's service, at the Post-Graduate Hospital. At the time of admission she was weak, emaciated, and acutely ill, and was running a temperature ranging from 100°F. in the morning to 104°F. in the evening. There was no natural bowel movement, all feces escaping at the site of the appendix operation. The skin about the wound was badly eroded. The urine was loaded with pus and it was found that the temperature was due to a complicating acute pyelitis.

Under appropriate treatment the temperature came down, but at this stage the child weighed only 25 lbs. and was a most unpromising surgical prospect. Something had to be done, however, so it was decided to attempt to close the fecal fistulas. On March 19, 1920, under ether anesthesia, the abdomen was opened, and the lower ileum found to be the seat of the obstruction. The gut was so thickened and knotted together that resection seemed to be the only rational procedure. The involved intestine containing five fistulous openings, was resected and an end-to-end suture anastomosis was performed. Following operation the bowels moved with enema on the third day. There was a mild infection of the abdominal wound, but the patient made a good recovery and was sent to the Babies' Convalescent Home, at Sea Cliff, three weeks later, with instructions to return to the Post-Graduate Hospital in the fall for the repair of the incisional hernia, which developed almost immediately after the operation.

On October first, 1921, this hernia was repaired and the patient allowed to go home two weeks later. About a year after her discharge from the hospital she developed an acute cystitis, and was taken to New York Hospital, where an examination revealed the presence of two bladder stones, which were removed by a suprapubic operation. Since that time she has remained well and has developed into a healthy normal child of her years.

The case is shown to illustrate the distressing morbidity, namely peritonitis, intestinal obstruction, multiple fecal fistulas, pyelitis and bladder stones, which may follow a late operation for acute appendicitis, and also to show the remarkable recuperative ability of a young subject against great odds.

ANEURYSM OF THE INNOMINATE

SYNCHRONOUS LIGATION OF SUBCLAVIAN AND COMMON CAROTID WITH LONG SURVIVAL. UNUSUAL INCISION*

J. F. Baldwin, Major, Major, M.C.U.S.A.

COLUMBUS, OHIO

On May 19, 1910 Mrs. F. M. R., aged fifty-two, was operated upon for a well-marked aneurysm of the innominate; Drs. Bigelow, Fletcher and others were present. History: Married thirty-four years; 10 children, youngest ten; labors natural; 2 miscarriages without trouble; 8 children living and in good health; 2 died of summer complaint. Patient had noticed the presence of the throbbing lump for about six months. Her physician, the late Dr. Jones, had been consulted two weeks before.

Examination shows an aneurysm of the innominate artery apparently involving the beginning of the subclavian. It extended about 1½ in. above the clavicle. Its lower border could not be determined. Roentgenograms were made, but threw no special light upon the tumor.

In studying the case it seemed to me that the best incision would be one extending upward and outward from the clavicle between the two heads of the sternocleidomastoid. This incision was accordingly made, and after separating the deeper tissues with the handle of the scalpel an ideal exposure of the junction of the innominate was secured with the subclavian and carotid arteries. The aneurysm involved the innominate and also the beginning of the subclavian and the common carotid. Two kangaroo tendon ligatures were applied to each of the two arteries at their origin, care being taken that they were not tied too tightly. The field of operation was absolutely bloodless. The operation took but a few minutes, and the incision was closed without drainage. No slightest evidence of any disturbance of either the brain or the arm followed and the patient left the hospital in fine shape on June 9.

One of the most interesting features of the case was that the patient never had the slightest recurrence of the aneurysm, but died in her seventieth year January 1, 1928, of chronic nephritis, nearly eighteen years after the operation.

It seems to be a settled surgical proposition that proximal ligation of the innominate for aneurysm of that artery is so fraught with danger as to be an absolutely unsurgical procedure, and that the proper treatment is ligation of the subclavian and carotid. We are told that the immediate mortality, from circulatory disturbances of the brain, is about 15 per cent, and that few patients live beyond three years from the date of ligation. In this particular instance the prolongation of life was probably due to the absence of lues, as shown by the personal history and the large and healthy family of children. The case is reported to put on record the favorable result, but particularly to bring out the perfect exposure secured by the incision which was adopted. Previous to the operation I was unable to find any such incision recommended, and since then have failed to find any suggestion in works on operative surgery of such a method of approach.

* Submitted for publication, September 11, 1928.

STRANGULATED INGUINAL HERNIA IN INFANT TWENTY-SEVEN DAYS OLD*

JAMES M. TROUTT, M.D., F.A.C.S.

HONOLULU

MALGAIGNE[1] made the alarming estimate that during the first five years of life, one child in

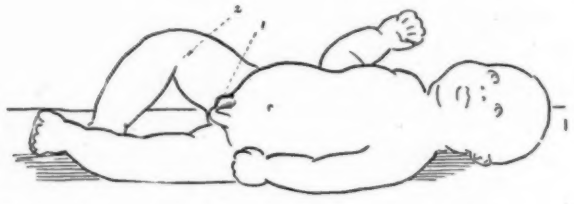

FIG. 1. Strangulated inguinal hernia in infant twenty-seven days old. 1. Tumor in right groin. 2. Note drawn-up attitude of right leg.

every 21 has hernia, but during the next eight years, spontaneous cure occurs in three-fourths of these cases, for at the age of thirteen, there is only one hernia for every 77 children. Ochsner[2] expressed the reassuring opinion that the vast majority of hernias in children are cured, or are susceptible of cure without operation. This is brought about by correction of artificial and developmental predispositions.

Most surgeons are opposed to routine repair of uncomplicated hernia in infants and children. This conclusion was reached by Bull and Coley, whose experience at the New York Hospital for Ruptured and Crippled permits them to speak with assurance. Buford[3,4,5] has written extensively on surgery in infants, and adopts a very conservative attitude on hernia.

But in the presence of strangulation there can be no question about operation. In the literature at hand I can find no mention of the frequency of strangulated hernia in infants, nor of the earliest age at which it has been observed. Buford does not touch upon these points. Many unusual cases of strangulated umbilical hernia in infants have been reported, among the most interesting of which is one by Pereira,[6] of a baby fifteen hours old, who was operated upon successfully. Strode[7] of Honolulu recently operated for strangulated inguinal hernia on the right side in a male child forty-one days old who recovered promptly.

This case is reported with the idea that it may be of interest, due to the unusually tender age of the patient.

CASE REPORT

R. P. L. A., male, twenty-seven days old, was admitted to Tripler General Hospital by transfer at 5:30 P. M., November 5, 1926, with the diagnosis of strangulated inguinal hernia, right side, of three hours' duration. The child had been delivered in this hospital and there was no evidence of hernia at birth or subsequently. The child was breast fed but was frequently constipated and suffered with flatulent colic and crying spells.

The mother had not noticed any abnormality suggestive of hernia till shortly before 3:00 P. M. of the day of admission, when a physician was called to see the child because of a digestive disorder which had commenced twenty hours previously. Strangulated hernia was diagnosed and gentle attempts at reduction by taxis were ineffectual.

On admission to this hospital the child was in fair condition but appeared lethargic, with evidence of moderate toxemia. The temperature, pulse, and respiration were slightly elevated, and the child was quiet. He had refused the breast upon the last few occasions but was not vomiting. The bowels had not moved for twenty-four hours nor had there been passage of flatus for six hours. The abdomen was generally tender and distended but visible peristalsis was not observed. In the right inguinal region and in the upper part of the scrotum there was a smooth globular tumor, as

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large as a hen egg, which gave a tympanitic note on percussion. The tumor was immovable, tense, and the overlying skin was reddened and glistening. The most tender handling of the tumor made the child cry. The diagnosis was evident. Figure 1 gives a schematic representation of the tumor.

Under chloroform anesthesia circumspect efforts at reduction by taxis failed, even with the child inverted. Very little time and effort were expended on attempts at reduction by taxis and a routine herniotomy was rapidly performed. A loop of small gut, 6 inches long, had become strangulated in a congenital sac, with the point of constriction at the internal ring. The gut showed evidence of moderate damage but was viable. Hot applications improved the situation promptly. The sac was excised after high ligation and the stump kocherized. Three interrupted chromic gut sutures were used to close the canal, one above and two below the cord.

Aside from bloodstained stools for a few days, the child made an uninterrupted recovery and was discharged from hospital on the tenth day. The wound remained sweet and free from infection, despite the practical impossibility of keeping it clean and free from contamination by urine.

It is now over a year since operation, and there is no evidence of a recurrence of the hernia.

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The American Journal of Surgery

Publishing the Transactions of THE AMERICAN ASSOCIATION FOR THE STUDY OF GOITER; THE NEW YORK UROLOGICAL SOCIETY; SECTIONS OF SURGERY, GENITO-URINARY SURGERY AND ORTHOPEDIC SURGERY OF THE NEW YORK ACADEMY OF MEDICINE; LOS ANGELES SURGICAL SOCIETY, ETC.

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EDITORIALS

WHO AND WHAT IS A SURGEON?

THE February, 1928 number of The American Journal of Surgery carried an editorial entitled "Surgeons, Real and Psuedo."

We drew attention to the obvious fact that any graduate of medicine with a license to practice was permitted by law to undertake any minor or major surgical operation. The physician's conscience, alone, was the guide in establishing the fact as to whether or not he was capable of assuming such surgical responsibility. Inasmuch as not "every physician" should be permitted to do surgery, but only those specially trained in this branch of medicine, we asked for a solution of the problem, acknowledging that such a solution was beyond our abilities.

This editorial drew a large number of letters addressed to the editor. Many were the solutions offered. One distinguished surgeon from Ohio said the answer lay in State medicine. Another equally well known surgeon said the matter should be put up to the American College of Surgeons for a solution. A gentleman from the southern part of Texas wrote us a peppery letter, asking if the "surgical-trust" wasn't satisfied with things as they now stand, and how was a common or garden variety of general practitioner going to finally make a living out of the profession, anyway. A surgeon from the Northwest said it was a matter for each state to decide, but that there should be special qualifications and special licenses for those claiming to be surgeons.

All in all, we enjoyed it very much indeed and were surprised that our innocent bit of writing was so widely read and contained sufficient kick in its lines to prompt readers to take their quills in hand and address communications to us. In the end, however, the problem was far from settled.

There is a difference of opinion about this question. Many would leave things in the present state, others would work for

radical changes. These changes range from State Medicine to a four years post-graduate course with college examinations to earn a special surgical degree, also, special examinations, etc., in order to be licensed by the state.

In the press of other matters we had put aside this problem, assuring our inner self that one day we would revert to it.

That this matter has occupied many other minds is proved by the report of a subcommittee on medical education of the New York Academy of Medicine in May, 1928, and an abstract was printed in the August Bulletin of the New York Academy of Medicine. This abstract was entitled; "Suggestions for Improving Post-Graduate Teaching in the Operative Specialities." We here reproduce it:

A review of the post graduate courses offered in the surgical specialties in New York City gives the distinct impression that they are inadequate and that there is need for improvement. New York City with its enormous clinical facilities should be the teaching center of the western hemisphere. It should be a place where specialists are trained and where doctors may come to improve themselves in their respective specialties.

There is at the present time no adequate control over physicians who propose to practice a surgical specialty or who are doing surgery, nor is there any prescribed method of procedure by which one may qualify as a surgeon. It is true the American College of Surgeons requires the submission of a certain number of case-records before a candidate is admitted to membership in that body, but there is no supervision or requirement regarding the obtaining of these records. It seems that the entire system of developing specialists may well be changed. Graduation from a recognized medical school or even graduation from a general hospital is hardly sufficient to qualify the average doctor as a specialist in any of the surgical branches. It would seem wiser to require a special period of training for every physician who intends to become a specialist in one of the operating specialties. Of the many house surgeons who are being graduated from general hospitals only a small percentage can ever hope to become members of the attending staff. The majority enter general practice after a hospital course which has been largely specialistic, and much of the training has been wasted on them. We would therefore suggest that an attempt be made here in New York City to get the various hospitals to agree upon some definite plan for improvement.

New York University and Bellevue Medical School has taken the initial step in this regard by establishing a course of post graduate instruction lasting 2½ years. It is composed of laboratory work, demonstrations, lectures and practical hospital work. During the latter period the student assumes the position of an adjunct surgeon and actually performs operations. Such a course may well serve as a guide; on the other hand the following plan may be more satisfactory for a larger group.

The majority of the New York hospitals offer a general course of interneship of about 2 years, emphasizing either medicine or surgery, as the case may be. We would suggest that an attempt be made to get all hospitals to agree to offer a general course of one to two years to include medicine, surgery, obstetrics, gynecology and all the specialties as far as they are able to, in order to fit a candidate for general practice. None of these graduates however should be permitted to pose as specialists or to perform major operations.

Those men who during their interneship show special desire or inclination to perfect themselves in a given specialty should at the end of their period be eligible for appointment as fellow or resident to serve a given period of one to two years, during which time they should be given opportunity to perform major operations and to study every phase of their specialty in the wards, the laboratory, the clinic and the x-ray department. We feel that there is a trend along this line at the present time, and that we in New York City should anticipate it and take steps in this direction.

Those men who desire to take up the various specialties such as ophthalmology, otology, laryngology, urology or any other subdivision should try to get appointments in special hospitals devoted to those subjects or in the specialistic departments of the larger general hospitals.

The Committee recommends the establishment of some organization which will work out a detailed plan along the lines indicated. The Academy of Medicine would be the logical

institution to do so, perhaps in collaboration with the well-endowed medical schools and all the larger hospitals of our city that are willing to co-operate. The entire plan would be voluntary on the part of the interested institutions.

The Committee in charge might be authorized to confer a special surgical degree or diploma on the candidates taking the course. In case the plan proves successful an attempt might be made to make it national in scope. It would seem that the American College of Surgeons should have a sub-department to study the entire problem of post graduate teaching of surgery in America.

This is a good start. Naturally, the reform (how we dislike that word) will not come overnight, or in two years, for that matter.

That it is a pertinent problem with our advancing, and day by day more complex, times, there is no doubt.

We welcome further letters from our subscribers giving their solutions to this problem.

T. S. W.

BRITISH LETTER

INTRAVENOUS INJECTION, TREATMENT FOR VARICOSE VEINS

G. H. Colt, F.R.C.S., said recently in a post-graduate lecture on the modern treatment of varicose veins: "The passing of the operative treatment of varicose veins may be regarded as a merciful release for the surgeon . . ." It does not appear so long ago that we were still laboriously dissecting out long segments of the internal saphenous and its branches. After a comparatively short trial of the injection method we are practically informed that operation seems to be no longer justifiable except in certain very isolated cases. Most surgeons will agree that they have been sorely disappointed at times with the operative treatment of varicose veins and ulcers and any substitute treatment, that on sound anatomico-physiological grounds will ensure better results, will command general acceptance.

Colt's paper gives a brief historical resumé of the development of the operative methods and quotes a paragraph from Sir Benjamin Brodie's "Lectures on Pathology and Surgery," 1846, giving a very clear account of the so-called Trendelenburg's sign:

If the veins are but little dilated, or dilated only in particular places, the valves will still continue to answer the purpose for which they were designed. If the vena saphena be not at all dilated, while the smaller veins of the leg are dilated, the valves of the vena saphena act perfectly, and take off the weight of the column of blood pressing on the veins below; but if the vena saphena be itself considerably dilated, its valves, of course, are rendered inefficient. Now observe the result of this. I had a patient in whom there was an unusually large cluster of varicose veins on the inside of the leg, while the vena saphena major was of enormous diameter, so that the valves were evidently good for nothing. If I put on a bandage and squeezed the blood out of the veins below and then put my thumb on the vena saphena above, so as to stop the circulation through it, I found, on taking off the bandage, the patient being in the erect posture, that the cluster of veins below filled very slowly and only from the capillary vessels. But if, the patient being in the erect posture, I removed the pressure from the vein, the valves being of no use, the blood rushed downwards by its own weight, contrary to the course of the circulation, and filled the varicose cluster below almost instantaneously.

It must be recalled that before treatment by intravenous injection was tried there was an era, the last quarter of the 19th century, of extra or perivenous injection methods, amongst the various substances tried being solutions of ergot, perchloride of mercury, carbolic acid and alcohol. But these caused serious sloughing and were soon discarded. In the first decade of the 20th century numerous investigators were attempting intravenous injections using solutions of potassium iodide, and mercurial and arsenical preparations, notably salvarsan, with definite successes. Hanschell in 1913 was successful with a solution of gummi. However it is

due chiefly to the work of Professor Sicard of Paris and his colleagues that we have now acquired the much improved technique with sodium salicylate, strengths of 20 per cent to 60 per cent being used. Today some prefer to use a neutral solution of quinine hydrochloride, 13 per cent with 6½ per cent urethane as an analgesic (Genevrier and Cibrie); others use Nobl's solution of glucose 50 per cent. In an note on the pathology, Colt states that "after injection the vein contracts and the walls may actually stick together, giving a splendid result surgically." The pathological evidence shows, however, that the characteristic reaction is primarily an irritation of the inner coat of the vein, an "endovenitis" (Sicard), and such clot as may be formed becomes firmly adherent to the intima. In a week this clot is undergoing rapid organization.

Colt says it is quite common now to obtain an almost complete obliteration of a valveless internal saphena system after one injection. Colt describes his technique as follows:

The patient stands on a chair near a table and a single band tourniquet is lightly applied around the upper part of the thigh, to help to prevent the veins from emptying too rapidly during recumbency. The patient then lies down on the table and the vein is entered, preferably above the knee or in the main trunk of it below the knee; the tourniquet is loosened, the vein is emptied of blood near the needle, and a finger is placed on it above the middle of the thigh; 2 to 6 c.c., according to the size of the veins, of 30 per cent sodium salicylate, with 10 per cent sodium chloride solution (P.D. and Co.) are injected, preferably towards the groin; the limb is elevated to 30 degrees for three seconds and then the patient rises slowly and stands on the chair. The finger is removed and the charge of solution sweeps downwards into the saphena system. This is painful for half a minute. The patient describes the pain as continuous and stinging or as cutting, lancinating, or cramplike and feels it travelling down the leg to the foot. These omens are favourable. By letting the patient lie down at this stage and again elevating the limb for a few seconds the solution may perhaps be tipped back again or kept a little longer in the saphena. Active muscular movement at once sucks the solution away and dilutes it rapidly. No bad effect has been noticed. Sometimes the solution must miss outlying varicose groups because these may require separate injections a week or a fortnight later, when the effect of the first injection has become manifest. At this time also the external saphena system, or the large anastomotic vein from the external to the internal system, which is often present in front, below, or above or behind the knee, may be injected. A week after the first injection the internal saphena system is generally hardening from the middle of the thigh to the lower third of the leg. Exceptions seem to be explicable by the well-known common sites of the chief deep anastomosing channels which dilute the solution.

The main bogey of the treatment is embolism and we are apt to forget that this may also arise after operation. T. T. Higgins says the probability of this complication is exceedingly small, more especially if firstly we make sure there is no local or distal form of sepsis which might cause an infection of the injected vein. Secondly we advise the patient to avoid all excessive muscular activity until the process of organization in the injected vein is well advanced, that is three weeks from the date of the last injection.

OPERATIVE TREATMENT OF FRACTURES

The Orthopaedic Section of the Royal Society of Medicine in its last Session had the privilege of hearing Dr. Charles Scudder open a debate on the "Operative Treatment of Fractures."

Dr. Scudder stressed the need for obtaining proper alignment by the best methods possible, be they operative or non-operative in order that function may not be in any way impaired.

Having denounced the old ideas of the necessity of prolonged immobilization he proclaimed the benefit of the principles of massage and movement established by Lucas Championnière and further propounded by Mennell.

It follows, therefore, in the treatment of

many fractures, that these early manipulative procedures can only be carried out if absolute fixation is secured by an open operation, which will permit movement of the joint without disturbing the fracture. By comparison with the progress of treatment in other surgical conditions the practice of the open operative treatment of fractures is a logical development standing on the firm basis of established aseptic principles. We owe much to the pioneer work of Sir Arbuthnot Lane, who not only pointed out the disabilities accruing from deviation in the true alignment of bones after fracture, but his work was the master mind that first devised an adequate armamentarium and perfected the technique necessary for the open treatment of fractures. It must be assumed for the carrying out of the operative treatment that:

The patient must be in a surgical home or hospital with every facility for the treatment.

The surgeon and his assistants must be skilled in the method and technique.

The proper instruments and apparatus must be available.

The anaesthesia must be suitable and skilfully given.

The pre-operative care must be adequate.

The postoperative care must be carefully supervised.

The early movement of the contiguous joints and careful massage must be undertaken as early as possible.

Dr. Scudder reiterates many of the points he made in his paper published in The American Journal of Surgery for July, 1926 and rightly says the great advance in fracture treatment will inevitably be along operative lines. This advance should be safeguarded and limited to skilled surgeons in suitably equipped hospitals, and should be further protected by the control of a group of surgeons in the particular hospital. He gives his opinion of the qualifications a surgeon dealing with fractures especially should possess, namely: (1) An adequate knowledge of the patient, physically, mentally, industrially, socially. (2) An exact knowledge of all the conditions bearing on the case. (3) Perfect instrumental, mechanical and physical equipment, including access to roentgen-ray apparatus. (4) An accustomed proved operative technique, delicately balanced. (5) An understanding of the sensitive nature of bone tissue, its reaction to injury and the conditions influencing the process of repair. (6) A practical experience of the modern nonoperative methods. (7) A knowledge of the various tried and accepted operative procedures for the approaches to and the immobilization of fractures. (8) An open mind in selecting the method best adapted to the case in hand.

This list of qualifications is by no means too exacting, and no surgeon should attempt the operative treatment of fractures unless he has thoroughly grasped these fundamental principles, has acquired the necessary technique and has at his command all the implied facilities.

The discussion that followed was opened by Sir Robert Jones who said he was pleased to find that Dr. Scudder, though a strong advocate of the purely operative methods, also urged perseverance in the nonoperative methods. He emphasized the importance of gradual traction, more particularly in fractures of the femur and instanced certain fractures in which he considered operation necessary, namely spiral fractures of the tibia, certain forearm fractures and fractures of the scaphoid and patella and concluded by saying that: "though any school might maintain that a certain course was best they (orthopaedic surgeons) should refrain from saying other methods were unjustifiable."

Amongst others taking part in the discussion were Messrs. Hey Groves, H. A. Fairbank, W. A. Cochrane, P. B. Roth. The general impression was that much depended on the individual surgeon and his efficiency in operative and non-operative measures, that final judgment must depend upon the comparison of end results.

This depends upon the accuracy of case records which could best be collected for reference by the establishment of fracture services generally in hospitals.

FALLACY OF X-RAY IN ABDOMINAL DIAGNOSIS

Mr. H. J. Patterson opened a discussion at a joint meeting of the Sections of Surgery and Radiology at the Annual Meeting of the British Medical Association at Cardiff, under the title of "The Fallacy of X-rays in Abdominal Diagnosis" the gist of the matter being that, flattering ourselves as we do that we live in a scientific age, we are apt to forget there is an art and practice in medicine and that radiology is an aid, not a substitute, for clinical medicine and surgery. We are far too ready to accept as gospel the diagnosis made in the laboratory or *x*-ray room, without giving due weight to the clinical examination. Laboratory investigations are good servants but bad masters. "Don't let the radiologist wag your tail" as our American friends have pithily said. He groups the fallacies under the following headings:

1. Fallacies incidental to the *x*-rays, that is, errors in timing the passage of barium meals; errors due to local spasm in the alimentary tract.
2. Fallacies due to technique.
3. Fallacies of misdirection, attention being directed to some abnormality of less import than the real disease.
4. Fallacies of interpretation—the most numerous.

He puts forward two practical suggestions: Firstly, if the radiographical findings do not support the clinical signs and symptoms they should be disregarded. An operation should rarely be performed on a purely radiological diagnosis. Likewise an operation which is advisable for clinical reasons should not be deferred through lack of radiological confirmation. Secondly, he would urge closer cooperation between the surgeon and the radiologist. They should not work in watertight compartments. The surgeon should be present at the radiological examination and draw his own conclusions from what he sees. Each should form an independent opinion and then in consultation try to agree on a diagnosis. Likewise the radiologist and, "may I suggest it, the physician," should be present at the operation, to see how far the condition found is in accordance with their previous conceptions. Such a practice would be to their mutual advantage and would lead to greater accuracy in diagnosis. Above all, we must keep a sense of proportion. Too much science may mean too little common sense. Radiology, like any other invention, must be used with discretion and with that

> Good sense, which only is the gift of Heaven,
> And tho' no science, fairly worth the seven.

John H. Watson, M.D., F.R.C.S.
Burnley, England.

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[From Fernelius' Universa Medicina, Geneva, 1679.]

BOOKSHELF BROWSING

THE SIMS MEMORIAL ADDRESS ON GYNECOLOGY*

DOUGAL BISSELL, M.D., F.A.C.S.

NEW YORK

WHAT a storehouse of knowledge there is to be explored in the subject you have assigned me! What romantic and thrilling experiences might be related to stir the imagination of those who love adventure; what courage might be given the faltering and disheartened; what noble impulses might be awakened to help suffering humanity.

Although I find myself unequal to the task, I am not wanting in sympathy and enthusiasm for the cause you have at heart, and I accepted the invitation to address you with the feeling that it was prompted not by your confidence in my ability to do justice to the subject, but because I am a native of the state in which Sims was born; that like him, I left my home to work out my destiny in the great metropolis of America and that having served my apprenticeship in the hospital he founded, and having lived in the midst of the evidences of his surgical skill, I might be able to contribute something which would reawaken interest in his noble life and stir his fellow countrymen, not only to cherish his memory, but to erect a fitting monument to his great genius.

The meaning of the term "Gynecology" has varied with the changes of time, but the literal meaning of the original Greek words of which it is composed is:

A Woman—Understanding

If it was the intention of the etymologists in devising this term to direct the mind in a line of study with the purpose of understanding woman, they must have had, in the midst of their sublime ignorance, an unlimited confidence in man's ability to solve intricate problems, for, and I think the statement will go unchallenged, the more knowledge we acquire of human nature, the more clearly it appears that there is no more likelihood of man understanding woman than there is of woman understanding man. The charm in the quest is in its eternal mystery.

If we accept the present interpretation of the term "gynecology," a study of diseases peculiar to woman, the work is restricted to a very limited field and it will be my purpose, during the discussion, to offer reasons for a broader interpretation.

While history is the framework upon which this address is built, it will not always be followed chronologically and the narration of the great surgical achievements will be made not so much to point out the successive steps as to emphasize

* Read before the South Carolina Medical Society of Charleston, November 22, 1927.
Submitted for publication, August 24, 1928.

the solidity of the groundwork laid by the pioneers of gynecology. The chronicling will be of those events occurring in the 19th century, as it was in that century that most of the fundamental surgical principles were discovered and put in practice.

We propose in this paper to devote most of our attention to American gynecology, its growth and achievements. But, as a background upon which to paint the picture, let us briefly summarize the knowledge the ancient writers left us on diseases of women.

All historians writing on the period before the Christian era give credit to the Egyptians and Arabians for having devoted special study to the treatment of diseases peculiar to woman. The Hebrew writings give evidence of a definite knowledge of some of the special functions of the female and of the obstetrical operation we now term cesarean section. In the writings of Hippocrates a definite effort is made to systematize observations on diseases of woman. Soranus wrote on the uterus and pudendum. The ancient teachers knew of tubular, bivalve, trivalve and quadrovalve specula, and Galen, who remained the authority even throughout the dark ages, added but little to the study of this special subject. During the Middle Ages the bivalve speculum was used, neglected, then forgotten. Astruc of the medical faculty of Paris reinvented it during the year 1761 and again it passed into oblivion until Récamier in 1801 reintroduced the tubular speculum and brought it into practical use for exposing and treating diseases of the genital tract, and by so doing revived interest in the almost forgotten study of the disease of woman.

Surgical gynecology is in reality but a branch of general surgery and when its growth is retraced it is found that, like every branch of scientific medicine, its roots find nourishment in a common source. The study of the anatomy of the human body, as made and practically demonstrated by Vesalius, (1514–64) gave to the world a scientific basis upon which to build. Next in order of importance was the study of the functions of the organs and to Harvey (1578–1657) we here do homage for his discovery of the circulation of the blood. John Hunter (1728–1793) applied this newly acquired physiological knowledge to his profound anatomical knowledge and through animal experimentation gave to the world the operation for the cure of aneurysm, which opened the door to scientific surgery. Closely related to Harvey's great physiological discovery was the co-discovery by William and John Hunter of the placental circulation, while William Hunter added additional knowledge to the study of the reproductive organs during pregnancy.

These latter discoveries were perhaps the first important scientific contributions to the study of functions peculiar to the female and gave direction to research which culminated in the special subject, gynecology.

The impetus that was given to European gynecology at the opening of the 19th century might be ascribed, not only to the reintroduction of the vaginal speculum, but also to the invention of the curette. These additions to the knowledge and practice of gynecology did not however, greatly enlarge its therapeutic and surgical horizon, for the speculum, as then constructed, gave only a limited opportunity for surgical treatment of the genital tract.

In the year 1809, far away from the center of European medical culture, American gynecology was born. The scene of action was in the virgin forests of Kentucky; the chief actor, a young country physician with no reputation save that which he established within the radius of a few hundred miles. Self-taught in the art of practical surgery, he grasped the opportunity when it came and through courage, vision and innate ability, rose to the task of doing the supposedly impossible.

If I read history correctly and interpret it aright, gynecological knowledge throughout Europe was meager when Ephraim McDowell studied at Edinburgh, then the

medical center of the world. He acquired from that source no direct assistance in gynecological thought, but his gifted teacher, John Bell, did lay a foundation upon which McDowell built and his eloquence lit that flame of surgical ambition which was not quenched until McDowell's death. McDowell's epoch-making surgical venture did not leap forth do novo. On his return to America in 1795, enthusiastic, ambitious and confident, he at once proceeded to operate boldly and successfully. His reputation extended into Tennessee and other neighboring states and he was called many times, hundred of miles away, to perform varied and grave operations. Though young, his surgical advantages over his colleagues were tremendous, for he not only had acquired fundamental surgical principles and a practical knowledge far beyond those about him, but had a genius for the work which surpassed their gifts. Tracheotomy, herniotomy, lithotomy and amputations were his daily work. Because of his busy life and a positive dislike for writing, he failed to place on record, and thus attain credit for much of the original work he did. But the central interest of his career to us is the surgical feat which swept him into fame. The story of this achievement is so dramatic that it will bear re-telling. It is one of the great landmarks of surgical history, an epic, a stepping stone by which surgery reached a higher plane.

December 12, 1809, marks the day of a momentous surgical discovery. It was then that McDowell was called to attend the now celebrated Mrs. Crawford who was mistakenly supposed to be pregnant and well beyond term. His diagnosis was tumor of the ovary and it became his painful duty to inform her of the inevitable course of the disease. He held out to her, however, one ray of hope, namely, that though the removal of such a growth had never been accomplished successfully, he felt that it might be, if she was willing to undergo an experiment in his hands. This woman was made of the same heroic stuff as was McDowell; she did not hesitate, but gave immediate consent and rode 60 miles astride a horse with the great tumor resting on the pommel of the saddle. Bruised and weary, she submitted herself to the surgical venture. Original and resourceful, McDowell met every danger with masterly skill; the operation was completed in twenty-five minutes; in twenty-five days she returned home restored in health and continued to live for more than thirty years after.

This achievement must be credited to America as an independent contribution to the art and science of surgery; it was the outstanding surgical accomplishment of that day, as was Hunter's aneurysm operation in his day. By thus showing the way to the unexplored field of abdominal surgery, McDowell established himself as one of the great surgeons and benefactors of mankind.

From 1835 to 1843 in spite of the great work done by McDowell, Nathan Smith, Alban Smith, Rogers and Bellinger, abdominal surgery made but little advance. A new impulse was given to it, however, in 1843 and 1844 by John L. Atlee, and later by his brother, Washington L. Atlee. The latter submitted a synopsis of his first 30 cases of which number 17 recovered and 13 died. This, as compared to former statistics, was startling and ovariotomy became established beyond question as a justifiable and humane procedure.

The early professional life of the illustrious Sims, whom we particularly wish to honor on this occasion, was no less romantic than that of his great predecessor, McDowell. When Sims began his studies, McDowell had finished his career. In contrast to McDowell's introduction into the practice of medicine, we find that of Sims to have been sad and discouraging. Sims did not have the advantages of McDowell and when the test came in his native village, he could not meet it. Failure drove him elsewhere but, like McDowell, he possessed an innate aptitude

for surgery; a consuming passion to relieve the sufferings of men and a determination to overcome all obstacles to attain an heroic purpose. These were the stimuli which made both men of action. Several years passed before Sims found himself, but when he did he showed leadership in thought and ability to conceive and execute ideas.

The narration of only one event in his early life, that which led him to his goal, is needed to illustrate his logical mind, inventive genius, tenacity of purpose and dynamic force. On being summoned to a Mrs. Merrill, who had been thrown from horseback, he found her suffering severely with pelvic pains. Her history directed him immediately to the probable cause and like McDowell he dared to venture where his thoughts directed him. Being convinced that an acute displacement of the uterus was the cause of her suffering, he at once proceeded to investigate; there was no precedent to follow, but in his young mind there existed a clear impression of a suggestion made in a lecture given by Prioleau of the Charleston Medical College which he attended during one session, that is, that if the uterus be found retroverted it might be replaced by the pressure of one finger in the rectum and one in the vagina. I can find no evidence in literature to show that a displaced uterus had ever before been so treated but Sims, the direct thinker, drew a correct conclusion, seized his opportunity to put a plausible theory to the test and, like McDowell, made a discovery which led the way to a new field of investigation and surgical accomplishments. His finger, for he used only one, acting as a retractor on the perineum and posterior vaginal wall permitted the entrance of air into the vagina, distending this organ to its full capacity. He was quick to grasp the fact that he had not only accomplished the restoration of the uterus but had made a startling discovery and one which could be utilized in the experiments he was then making to close vesico-vaginal fistulas. He at once developed the idea of a metallic retractor with handle and blade at a right angle. When it was applied as he applied his finger he saw, what man so far as history tells us had never seen before, the vaginal wall distended in its entirety.

New light was now thrown upon his vesico-vaginal fistula problem. This first great step left him unhampered with respect to vision and space and he thought that as he could now see to manipulate the silk sutures, success was assured; but, as he was ignorant of the cause of inflammation, he was again doomed to disappointment. He then concluded that his continual failures were due to the want of exactness and uniformity in apposition of the denuded surfaces which resulted from the difficulty he still found in tying the silk. It is unnecessary to dwell on further particulars of the four years struggle in perfecting his vesico-vaginal fistula technique, excepting to say that greater courage, confidence, resourcefulness and skill have seldom been exhibited in the annals of history. In the face of failure after failure, deserted by his once admiring and enthusiastic colleagues, working with the help only of the poor slave women who were no nearer cure after countless trials to relieve them, he at last achieved his purpose and ushered in a new era of surgical accomplishment.

In early Jewish literature there is sufficient evidence to suggest that hysterotomy had been done on the living woman and that both mother and child at times survived, for it is recorded that the child was "cut out of her side" and the question arose as to whether a woman in this condition should be considered clean or unclean. It is fair to presume that this question would not have arisen unless the women at times survived. Some European authorities, however, are of the opinion that hysterotomy before the 7th century was resorted to only on the dead, but there are records which would lead us to believe that, during the 7th century, hysterotomy was performed successfully by barbers on the living woman. A woman named Godard of

Milly in Gatony is said to have submitted herself six times to the operation of cesarean section and died in her seventh pregnancy because she could not find one willing to operate. Another woman named Quinville like Godard, was also operated on by a barber, "who is reported, perhaps as an excuse for the rashness of the act, to have been drunk at the time."

Prior to 1701 there is no recorded claim of surgery upon the intra-abdominal genital organs of the female which in any way bears the mark of authority. During that year one Robert Houston of Glasgow operated per abdomne and removed the contents of an ovarian tumor, but did not remove the cyst wall. Delaforte of France (1755) was McDowell's precursor in suggesting the idea of ovariotomy. Laumonier, also of France (1775), actually removed an ovary without intending to do so, while operating for an iliac abscess two years before McDowell's successfully planned and executed ovariotomy. Escher submitted a thesis to the medical faculty of Montpellier, in which he discussed, from a theoretical standpoint, a technique for tying the ovarian pedicle. McDowell's great achievement was therefore not that of priority in removing an ovary, but in having established by successive successful operations a technique essentially correct for removing a pathological ovary, and thus became the pioneer in abdominal surgery.

When Sims came upon the surgical horizon, considerable work had been done in vesico-vaginal fistula repair. In spite of the loathsomeness of the disease and the fact that it must have been prevalent throughout the ages, nothing is found in medical literature regarding it until Paré in the 16th century called attention to it and suggested a plan of treatment. In 1825 Lellemand of France recorded the first cure of vesico-vaginal fistula. He applied nitrate of silver to the edges of the fistula, approximating them by a "sonde ering" passed through the bladder wall. Of the 15 cases treated he reports 4 cures. Hayward of Boston, during the ten years between 1839 and 1849, reported 3 successful cases by extensive denudation of the vaginal surfaces about the fistula, which surfaces were approximated with silk sutures. Gosset of London (1834), used the knee-elbow position, a form of speculum to retract the perineum, a gilt wire suture and an elastic gum catheter to drain the bladder. His comment upon the gilt wire suture is worthy of note: "It excites but little irritation and does not appear to induce ulceration with the same rapidity as silk or any other material with which I am acquainted . . . you can therefore keep the edges of the wound in close contact for an indefinite length of time, by which the chances of union are greatly increased." He leaves the impression that cures were usual with this technique. Metzler of Prague succeeded in using the knee-chest position, a form of posterior retractor, perforated clamps with gilded needles, and perforated shot, by which the clamps were held together. He also claimed successful results. Later, Jobert de Lambelle used a method of autoplasty which was limited in its application and met with indifferent success.[1]

The early history of gynecology is as closely interwoven with that of obstetrics as obstetrics is with that of general surgery. But our historical interest as gynecologists, in the relationship between gynecology and obstetrics, is primarily in the early recognition of repair work and injuries of the birth canal. The first recorded recognition of these injuries was by Celsus (30 B.C. to 50 A.D.). Though clearly recognizing injuries to the general canal, he made no suggestions regarding surgical treatment, save to advise rest in bed and tying of the legs together. Guillemeau followed the suggestion of his great master, the intrepid

[1] To Simon credit should be given for the development in Europe, to the point of success, of the operation for the cure of vesico-vaginal fistula. This was done independently of Sims' work, though immediately following it. It proved practical in extensive lesions and sufficiently simple to be learned and followed by his colleagues.

barber surgeon and obstetrician, Ambroïse Paré, and applied with success interrupted sutures to the injured perineum. Until Dieffenbach of Berlin came upon the scene in 1829, there were recorded only two successful repairs of the perineum. Dieffenbach's argument and technique are so sound that they may be considered the foundation of this particular form of repair work and should in part be here briefly noted. He advised that the repairs be made as soon as possible after the accident in spite of the swollen parts and debility of the patient; that no rupture, however slight, should be left to nature and that three to five interrupted sutures should be inserted, beginning where the sphincter is torn; that when the vagina is implicated its fissures should be first brought together; in old cases, or secondary repairs, the edges of the fissures should be repaired before the injured area is approximated.

Germany thus played an important part in laying the foundation of plastic work on the female genitalia. The next important contribution worthy of note is that of Laugendeck, 1852, described by M. Verhaeghe of Ostend, and pertains chiefly to secondary repair work of the perineum, introducing the new element of flap dissection. Simon of Heidelberg modified Dieffenbach's technique by "Carrying the denudation up the vaginal vault . . . in the shape of a triangle." In complete rupture through the sphincter, he applied sutures crossing the perineal space in three directions.

Until the advent of Sims (1852) Europe was foremost in repair work on the genital canal of the female and the great contribution which he made was the rediscovery of the metal suture, in this instance a practical one namely, silver wire instead of lead or gilt, which revolutionized operative technique and added new lustre to American gynecology. Until this specific addition was made to the armamentarium of the gynecologist, primary union was not the rule, but the exception, for the operator usually applied the universally used silk suture to a more or less septic field. With the use of silver wire the picture changed and instead of primary union being the exception, it became the rule.

The development of plastic work as a result of the impetus given by Sims, brought America again to the forefront, but to Thomas A. Emmet we are indebted for the next great advance. Injury to the cervix uteri as the result of fetal expulsion was recognized by European surgeons as far back as 1851, but its true significance was not appreciated until Emmet published his papers on cervical repair in 1869 and 1874. He it was also who about the same time discovered and explained the reason for the dimples on each side of the lacerated and open anus, namely, that they were the result of the retracted ends of the ruptured sphincter muscle. Further, he advocated the exposing of the tissue immediately covering these muscle ends by denuding the scar tissue over them, approximating these ends by passing a silver wire through them and modified to advantage the perineal technique of Dieffenbach and Simon. Hagar's technique for extensive injuries of the vaginal outlet and deep structures and the technique of Goldspohn (1897) must be recognized as important steps in the development of plastic repair work, while Warren shared in the conquest of that dreaded injury, laceration of the sphincter ani.

It is not within the scope of this paper to enter into a technical discussion of the merits of any of these operations except to say, that while all of them possess merit none of them are universally applicable, for when the injury extends well into the rectum, exposing a considerable portion of that canal, Emmet's technique for complete laceration is difficult to successfully apply and the results are not uniformly good. Warren's is still less adaptable under these conditions. The most satisfactory technique I am familiar with, introduced before the 20th century, is that which apposes the cut edges of the rectal and anal mucosa with interrupted

sutures of very fine silkworm gut or horsehair, the free ends of these sutures being allowed to protrude through the repaired anal ring and the sutures to slough away. The author's name I do not know, but have always associated that of Cleveland's with it. Until Sims introduced his anterior colporrhaphy operation in 1856, improving it in 1858, little of importance in plastic surgery was done to correct deep injuries of the anterior vaginal wall. These procedures were, however, recognised by him and also by Emmet as defective and each of them independently, and almost simultaneously, made essential improvements. Emmet's technique proved the more satisfactory, however, and is still held in high esteem by many.

La Forte, in 1877, introduced a technique which was serviceable and met with favor in cases of pronounced uterine descent, but which, in attaining its object, interfered with the normal functioning of the vagina. This criticism is particularly applicable to Hartmann's modification. Perhaps the most revolutionary surgical effort during the 19th century to correct the pathology known as cystocele was that introduced by Watkins in 1893. Its essential principles, based somewhat upon the work of Freund and Wertheim, are freeing of the bladder from the anterior vaginal wall and the interposition and fixation of the corpus between these two organs. It is perhaps the most popular method in vogue today and reflects great credit upon its originator.

Early recognition of deep injuries to the posterior vaginal wall in childbirth should be credited chiefly to Hadra and Emmet of America and Schultz and Hagar of Europe, but no technique introduced at that time satisfactorily corrected extensive rectoceles. The evolution of this technique did not reach a satisfactory stage until after the 19th century, the history of which will therefore not be here related.

The most satisfactory technique employed during the latter part of the 19th century for the relief of uterine prolapse was that of Thomas A. Emmet and was essentially that which he used for the correction of cystocele. At the close of this century, Watkin's operation had just been introduced for cystocele, and up to that time had not been tested out for prolapse of the uterus. La Forte's technique, already mentioned, was also successfully applied to certain cases of uterine prolapse. The efforts of the early surgeons, from the time of Récamier, to cure this pathology was by a crude form of vaginal hysterectomy. The history of vaginal hysterectomy, therefore, extends into the very early days of modern gynecology and the cases selected for operation were usually those where the uterus was easily accessible. J. Warren of Harvard (1829) was the first American to operate with the uterus in normal position.

Geddings of Charleston, in 1854, was the fifth American to operate per vaginam, with the uterus prolapsed, but Noeggerath in 1877 was the first American to perform vaginal hysterectomy in accordance with modern methods. For many years vaginal hysterectomy technique demanded the leaving of an open vaginal vault with gauze packing in the opening, the vessels being secured by silk sutures, the ends of which were usually permitted to extend into the vagina. Clamps superseded this ligature method and offered many advantages. Subsequent techniques are those in vogue today. The vaginal route was, however, not generally adopted in preference to the abdominal route for the removal of lesions of the corpus uteri until the latter part of the 19th century; it then came into vogue because of the persistently high mortality by the abdominal route. When the abdominal technique improved so as to insure a lower mortality, the pendulum swung back to this route and the vaginal route was adopted only in selected cases.

The early history of vaginal section for the correction of intra-abdominal lesions other than those just mentioned is of particular interest, for we find that in 1816 John King of South Carolina incised

the vaginal vault and removed, by means of forceps and abdominal pressure, a full term child which had developed outside the uterus. Both mother and child lived. T. G. Thomas removed per vaginam, in 1870, an ovarian cyst about the size of a large orange. This was the first time that the vaginal route was selected and a method deliberately planned for this purpose. In 1874 Thomas followed King in the removal, per vaginam, of a three months ectopic fetus, using the galvanocaustic knife to incise the vagina.

The subsequent history of vaginal section during the latter part of the 19th century is in line with that of vaginal hysterectomy. Its vogue was chiefly the result of faulty abdominal technique and to follow it would be to no special purpose.

The abdominal technique for the removal of large tumors, or for pathology inaccessible per vaginam, has remained in principle practically the same since the days of McDowell, but, as new pathological situations were encountered, variations were necessarily introduced until the establishment of our present-day standards. Washington L. Atlee's triumph in ovariotomy has already been referred to, and to this great surgeon is credit given for the first abdominal myomectomy in 1844, while to John Bellinger (1846) is the honor given for the first deliberately planned and executed hysterecto-myomectomy. This operation was, unfortunately, followed by peritonitis and death.

Many great surgical, chemical, bacteriological, physiological and pathological discoveries were utilized during the latter part of the 19th century, which were essential to the development of our present-day vaginal and abdominal technique, but to give them more than passing notice is not within the scope of my paper.

I have often asked myself the question: Why is it that obstetrics have been unanimously accepted by the general surgeon as a speciality and gynecology has not? But when I remember the long weary hours I have spent at the bedside of the tired, expectant mother, hearing her repeated plaintive cries and waiting on nature to complete her task, I think I have found the answer.

Primary and secondary restoration of the birth canal to its proper functioning when severe injuries have occurred, is made only by surgeons skilled in this particular line of plastic work. These operators have, as their chief object, restoration of the organs to normal sex relation and obstetric function. As many of the injuries of childbirth are immediately repairable, the obstetrician should be thoroughly versed in the art and science of this special form of repair work, that he may not be compelled to call upon a specially trained surgeon when such injuries occur. He should be capable also of making secondary repairs of the common obstetrical injuries met with. Surgical activity in the field of gynecology would be greatly diminished were it not for obstetrical injuries and their ultimate results. Likewise, but perhaps not to the same extent, would the obstetrical field be narrowed, were it not for the intra- and extra-abdominal, conservative and constructive surgery of the gynecologist. The intimate relationship between surgical gynecology and obstetrics seems too obvious to require argument to prove that each is a part of the other.

To restrict gynecology to the study of diseases peculiar to woman seems an arbitrary and illogical proposition. To my mind it is just as absurd to consider the study of diseases peculiar to men or their genital organs a speciality as it is to consider the study of diseases peculiar to women or of their genital organs a speciality. In fact, the study of diseases peculiar to men has never been considered a speciality. We have always looked upon the genitourinary system of the male as one and have so classified it in our studies and surgical work. With this I am in full accord, for the reason that histologically the generative and urinary organs are closely akin, that anatomically and physiologically they are intimately associated,

that pathologically their diseases are frequently interdependent, and that surgically, their relationship being so intimate, operative work upon one demands special care of or surgical work upon the other.

It is conceded by the genitourinary surgeon that the female bladder may, with propriety, be included in the speciality of gynecology. In fact, there has been no contention about the inclusion of that portion of the ureter located between the bladder and the anterior vaginal wall, but beyond the vesical area the question of legitimacy of surgical activities by the gynecologist is in dispute, and the discussion seems to get more heated as we ascend towards the kidney. Should there be an arbitrary line drawn in surgery upon the female between the lower and upper urinary tract? Should the genitourinary specialist of the male or the general surgeon arrogate to himself the latter field?

The lower half of the female ureter is in close relation to the cervix uteri, the uterine plexus, the broad and the infundibulopelvic ligaments and an expert knowledge of its intricate relationship with these regions is just as necessary for special work in the female when pelvic diseases exist, as the knowledge of this particular portion of the ureter in the male when genitourinary surgery is being done in the pelvis of this sex. In fact, it is even more necessary, for the reason that in the female the intra-abdominal portion of the genital system is more extensive and complicated than in the male. The tubes, ovaries and uterus are all subject to varied pathological changes, any one of which may seriously involve the pelvic portion of the ureter, but surgery of this portion of the female ureter should be considered not only from the standpoint of injuries resulting from intra-abdominal pathology of the generative organs and traumatic injuries which they are subject to by operative procedures, but also of diseases arising from causes within the urinary tract itself. When problems of this nature arise, an operator familiar with surgery of the female pelvis possesses a great advantage over one not familiar with surgery of this character.

There has been a long battle for the recognition of gynecology as a specialty. In its development it has followed the laws of natural growth; at first a thing too small to recognize, but drawing its substance from many sources, it eventually came into being, a struggling mite, claiming a place in the sun. Today its workers constitute a large and intellectual group who have contributed during the past century as much to the achievement of surgical knowledge for the relief of mankind as any group in the field of practical medicine.

I believe, however, that the recognition of gynecology as a specialty will not be complete until its followers consider it that branch of medicine which pertains to the study of the anatomy, physiology, histology and pathology of the female genitourinary system and to the medical and surgical methods of correcting congenital and acquired abnormalities of this group of organs.

It may also be said, as a corollary, that while it is not necessary for an obstetrician or urologist to be a gynecologist in the extended meaning of the term, it is necessary for a gynecologist to be an obstetrician and urologist to the extent here defined. It is my further contention that is neither necessary nor desirable to change the term gynecology for, as its meaning has changed with each epoch, we have only to recognize a still broader meaning as being more suitable, that is, "The study which pertains to the genito-urinary organs of the female."

BOOK REVIEWS

To those familiar with the first edition of Alvarez's book, this, the second edition, will appear as an entirely new work THE MECHANICS OF THE DIGESTIVE TRACT.[1] Dr. Alvarez,

[1] THE MECHANICS OF THE DIGESTIVE TRACT. AN INTRODUCTION TO GASTROENTEROLOGY. Ed. 2. By Walter C. Alverez, M.D. 8vo, cloth. Pp. 446, 100 illus. N. Y., Paul B. Hoeber, Inc., 1928.

who made his reputation while a resident of the Pacific coast and added to that reputation since having been with the Mayo Foundation, writes in the preface, "The first edition was little more than a detailed statement of the gradient theory with its problems of gastroenterology; this one represents a determined effort to make readily available to thoughtful practitioners such information about the mechanics of the digestive tract as they need daily in their struggles to improve their diagnostic and therapeutic technic."

We have but one criticism of Alvarez's book: It would have pleased me to have had it a thousand pages longer. He has a distinct style in writing. It is a style that carries the reader along from topic to topic and chapter to chapter easily and unconsciously. His manner of meeting problems and explaining them is fascinating. He is curt and somewhat sarcastic in disposing of strange gods and dogmas and queer methods. While not truly orthodox yet he makes a point of tried and found true fundamental principles and from these starting points he builds his house of scientific logic, backed by laboratory and clinical experience.

The book opens with a chapter on "The Autonomy of the Digestive Tract." There follow chapters on:

The Myogenic Nature of the Rhythmic Contractions; The Function of Auerbach's Plexus; The Smooth Muscle of the Gastrointestinal Tract; The Extrinsic Nerves and Their Functions; Why Food Goes Down the Bowel; Gradients (every practitioner should read this and the following two chapters); The Underlying Metabolic Gradient; Other Related Gradients; Chewing and Swallowing; The Esophagus; The Cardia; Graded Differences in the Stomach Wall; The Movements of the Stomach; Hunger Contractions and the Pain of Ulcer; The Movements of the Stomach that is Diseased or has been Operated On; The Modus Operandi of a Gastroenterostomy; The Pylorus and the Duodenal Cap; The Movements of the Small Intestine; The Iliocecal Sphincter; The Movements of the Colon; The Mechanics of the Gallbladder; The Rate of Progress of Food Residues through the Digestive Tract; Vomiting; Practical Applications of the Gradient Idea; Reverse Peristalsis and Its Symptoms; Flatulence; Technical Methods and Apparatus.

There is a complete bibliography and an Author's Index and a Subject Index.

I have outlined the scope of this book so you will form an idea of what is really between its covers. There may be a gastroenterologist here and there who need not read this book but it is a safe proposition to chance that there are no general practitioners who need not read it. Every physician who sees patients and treats them for digestive disturbances should read and reread this volume. It will prove stimulating reading and be found a mine of useful information.

BOOKS RECEIVED

All books received by The American Journal of Surgery are listed in this column as soon as possible after their receipt and this must be considered as adequate acknowledgment. Books that the Editor considers of special interest to our readers will be reviewed in a later issue.

An der Schwelle der Chirurgie. By Emile Forgue. 8vo, paper. Pp. 142. Leipz., F. C. W. Vogel, 1928.

Die Chirurgie des Land—Schiffs—Und Kolonialarztes. By W. Von Oettingen, M.D. 8vo, paper, Pp. 410. Dresd. & Leipz., T. Steinkopff, 1928.

Diagnostische und Therapeutische Irrtümer und deren Verhütung. Vol. 9. Edited by J. Schwalbe, M.D. 8vo, paper. Pp. 317, 140 illus. Leipz., G. Thieme, 1928.

Einführung in die Diathermie. By H. Henseler, M.D. and E. Fritsch. 8vo, boards. Pp. 94, 63 illus. Berl., Radionta, 1928.

Modern X-Ray Technic. By Ed. C. Jerman. 8vo, cloth. Pp. 260, illus. St. Paul, Bruce Pub. Co., 1928.

Praktische Differentialdiagnostik. Chirurgische Krankheiten des Rumpfes und der Extremitaten. Vol. 4. No. 4. By August Brüning, M.D. 8vo, paper. Pp. 112. Leipz. T. Steinkopff, 1928.

Précis de Pathologie Chirurgicale. Ed. 5. 5 vols. By P. Lecène, L. Tixier, M. Patel and others. 12mo, cloth. Illus. Par., Masson et Cie., 1928.

Problems in Surgery. By George W. Crile. Edited by Amy F. Rowland. 8vo. cloth. Pp. 171, 49 illus. Phila., W. B. Saunders Co., 1928.

Scientific Reports from the Government Institute for Infectious Diseases. Vol. VI. Edited by Yoneji Miyogawa, M.D. 8vo, paper. Pp. 626, illus. Tokyo, Govt. Inst. for Infectious Diseases, Tokyo Imp. Univ. 1927.

Syphilis. By Charles C. Dennie, M.D. 12mo, cloth. Pp. 314, illus. N. Y., Harper & Bros., 1928.

Troubles Fonctionnels et Dystrophies a L'état Chronique en Gynécologie. By Paul Petit-Dutaillis. 8vo, paper. Pp. 476, 185 illus. Par., G. Doin et Cie, 1928.

Urology. By Edward L. Keyes, M.D., PH.D., F.A.C.S. 8vo. cloth. Pp. 763, 204 illus. N. Y., D. Appleton & Co., 1928.

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